AD-A149 901 DEPLOYMENT AREA SELECTION AND LAND WITHDRAWAL/ACQUISITION M-X/MPS (M-X/MU..(U) HENNINGSON DURHAM AND RICHARDSON SANTA BARBARA CA 02 OCT 81 1/1

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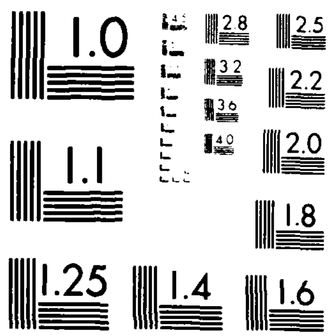

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M-X/MPS

ENVIRONMENTAL

TECHNICAL REPORT

PRELIMINARY FEIS

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NOISE

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DEPLOYMENT AREA SELECTION
AND LAND WITHDRAWAL/
ACQUISITION

DEPARTMENT OF THE AIR FORCE

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M-X ETR-10

ENVIRONMENTAL CHARACTERISTICS OF ALTERNATIVE DESIGNATED DEPLOYMENT AREAS: NOISE

Prepared for

United States Air Force
Ballistic Missile Office
Norton Air Force Base, California

By

Henningson, Durham & Richardson, Inc.
Santa Barbara, California

REVIEW COPY OF WORK IN PROGRESS

2 October 1981

DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330

OFFICE OF THE ASSISTANT SECRETARY

Federal, State and Local Agencies

On October 2, 1981, the President announced his decision to complete production of the M-X missile, but cancelled the M-X Multiple Protective Shelter (MPS) basing system. The Air Force was, at the time of these decisions, working to prepare a Final Environmental Impact Statement (FEIS) for the MPS site selection process. These efforts have been terminated and the Air Force no longer intends to file a FEIS for the MPS system. However, the attached preliminary FEIS captures the environmental data and analysis in the document that was nearing completion when the President decided to deploy the system in a different manner.

The preliminary FEIS and associated technical reports represent an intensive effort at resource planning and development that may be of significant value to state and local agencies involved in future planning efforts in the study area. Therefore, in response to requests for environmental technical data from the Congress, federal agencies and the states involved, we have published limited copies of the document for their use. Other interested parties may obtain copies by contacting:

National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
Telephone: (703) 487-4650

Sincerely,

JAMES F. BOATRIGHT
Deputy Assistant Secretary
of the Air Force (Installations)

1 Attachment
Preliminary FEIS

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1.0 INTRODUCTION

The construction and operation of the M-X system would produce two major sources of noise and consequent impact on the environment:

1. Highway traffic near the bases and within the M-X system

2. Airfield operation associated with the bases.

Secondary sources of noise would be:

1. Construction activities

2. Railroad traffic transporting materials to the sites during construction.

The purpose of this analysis is to establish, on a general level, the impacts associated with these noise sources, and to suggest mitigation methods where applicable.

1.1 EFFECTS OF NOISE

The effects of noise can be classified into three categories:

1. Subjective effects such as annoyance

2. Interference with activities such as speech communication, work, education, and sleep

3. Physiological effects such as loss of hearing, and stress related problems including nervousness and high blood pressure

Appendix A graphically presents the effect of noise on annoyance levels, sleep interference, and speech communication interference.

Excessive noise and vibration can also damage buildings and other structures.

1.2 NOISE MEASUREMENT

The magnitude of noise is often described in terms of sound pressure level, the basic unit being the decibel or dB. Because of the great range of sound pressures humans are capable of hearing, a logarithmic scale is used. Figure 1.2-1 illustrates the approximate relationship between subjective loudness and sound pressure levels. Figure 1.2-2 illustrates various noise levels in a suburban neighborhood. In Table 1.2-1 a list of the sound pressure levels for common noises is given.

Humans do not hear all sound frequencies equally. In order to obtain a valid relationship between what we hear and sound measurements, a filter known as the A-weighting network is often used to discriminate against low and very high frequencies. The resultant measurement is referred to as the A-weighted sound level in units, designated as dBA.

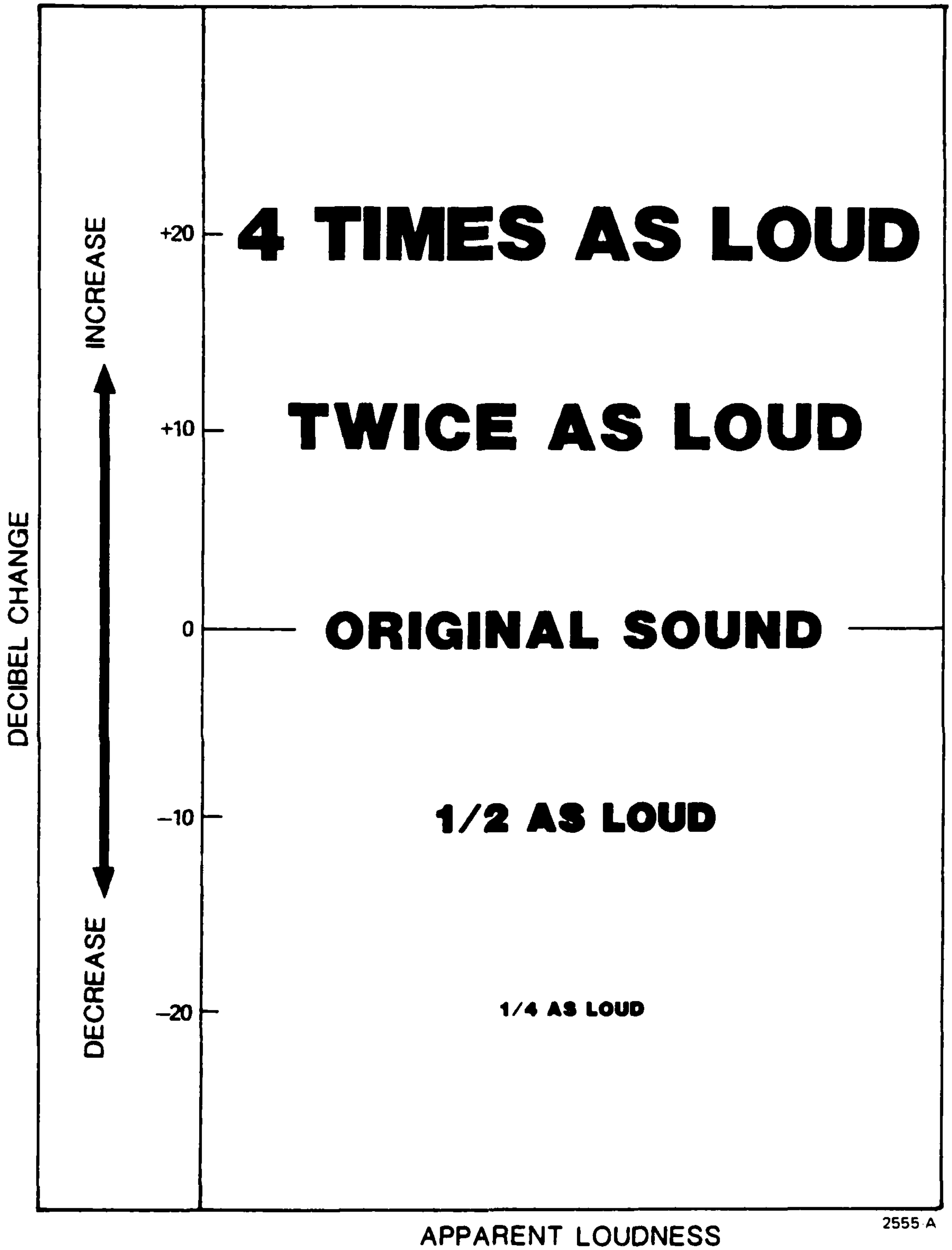

Figure 1.2-1. Apparent loudness as a function of decibel change.

Source: Beranek, Noise and Vibration Control, 1971

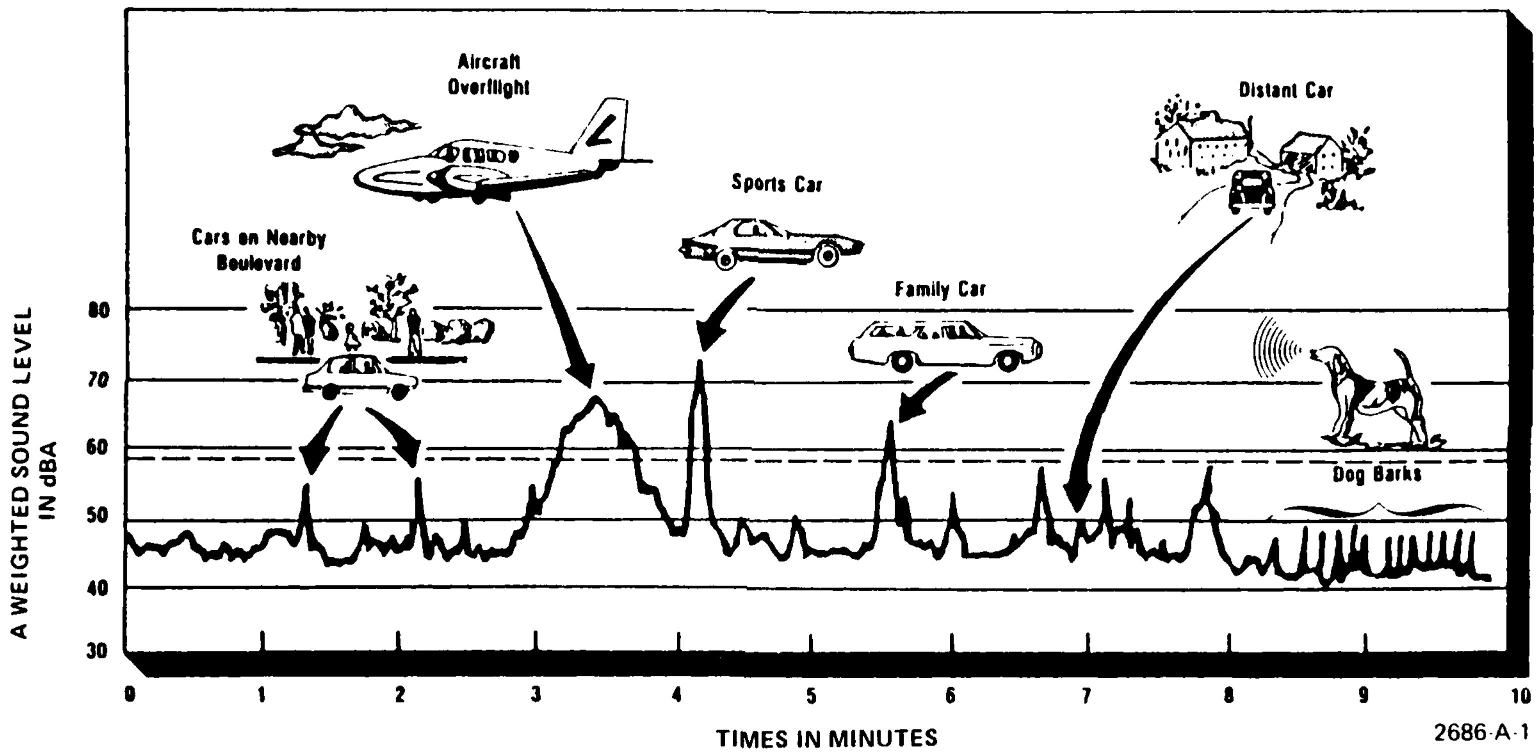

Figure 1.2-2. Typical outdoor sound measurement on a quiet suburban street.

Source: EPA, Protective Noise Levels, 1978

Table 1.2-1. Common noise levels.

dBA	Common Noise Levels
130	Threshold of pain
120	Chipping on metal
110	Rock band
100	Jackhammer
	Jet takeoff (1/2 mile)
90	Threshold of hearing damage
	Motorcycle (urban residential)
80	Busy freeway
70	Ice cream truck with music (urban residential)
	Power lawn mower (urban residential)
	Children playing (urban residential)
60	Normal conversation
50	Radio playing music (urban residential)
	Bird (normal suburban area)
40	Suburban neighborhood (distant traffic)
30	
20	Quiet rural area (no traffic)
10	
0	Threshold of audibility

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Source: HDR Sciences, 1981.

Different noise metrics have been developed for various noise situations because of the time periods and averaging methods used in the measurements, and the nature of the noises under investigation. Examples of these are the equivalent continuous sound level (L_{eq}), the day-night average sound level (L_{dn}), and the percentile exceeded sound level (L_x). A list of definitions is provided in Appendix B.

For traffic noise levels, the equivalent continuous sound level, L_{eq}, is given for the peak hour of traffic.

For airports, the day-night average sound level, L_{dn}, is used. This average penalizes sounds made at night between 10 p.m. and 7 a.m. by adding 10 dB to sounds during that period.

A second aircraft metric, the Noise Exposure Forecast (NEF), has seen widespread use. However, its use involves a complex measurement scheme, and, as a result, the more straightforward L_{dn} metric has now been adopted by HUD and other agencies.

Situations may arise in which an area is exposed to more than one noise source. Under these circumstances, the combined effect of the multiple sources is determined by adding the contributions from all sources logarithmically. This is applicable only for long-term average type noise metrics such as L_{dn} or L_{eq}. All sources' contributions must be represented by the same metric. The following formula is used to sum sources:

$$L\ total = 10 \log \quad 10^{Li/10} \quad \text{where } L_i \text{ is a single sound source}$$

As a result of this logarithmic method of dBA summation, when two sound levels are added and, for example, one is 5 dBA greater than the other, the overall sound level is only 1.2 dBA higher than the greater source.

1.3 REGULATIONS AND STANDARDS

Several federal, state, and local government agencies are concerned with noise regulations and standards. The Environmental Protection Agency (EPA) is the primary reviewer of all federal noise activities and also oversees vehicle noise limits. The Department of Housing and Urban Development (HUD) is involved with establishing noise exposure standards for residential construction. None of the states where the M-X system might be located has noise regulations. In general, local governments use the federal regulations as guidelines for their own noise control policies.

TRAFFIC NOISE REGULATIONS (1.3.1)

The Federal Highway Administration (FHWA) is responsible for setting noise standards for the location of new highways. Table 1.3.1-1 presents the current guidelines. According to HUD regulations for typical traffic distributions, the one hour peak L_{eq} is approximately equivalent to L_{dn} (Ref. HUD 24 CFR Part 51.106(a) (2)).

The FHWA design levels for residences are shown as L_{dn} 67. However, the HUD criterion for noise exposure in residential neighborhoods is L_{dn} 65 (Ref. HUD

Table 1.3.1-1. Design noise levels representing the upper limit of acceptable highway traffic noise levels.

ACTIVITY CATEGORY	DESIGN NOISE LEVELS* dB		DESCRIPTION OF ACTIVITY CATEGORY
	L_{eq}	L_{10}	
A⁻	57 (Exterior)	60 (Exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, open spaces, or historic districts which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B⁻	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, and parks which are not included in Category A and residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	—	—	Undeveloped lands.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

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*L_{eq} is the symbol for equivalent continuous sound level; L_{10} is the symbol for 10-percentile exceeded sound level. Either L_{eq} or L_{10} (but not both) design noise levels may be used on a project.

⁻Parks in Categories A and B include all such lands (public or private) which are actually used as parks as well as those public lands officially set aside or designated by a government agency as parks on the date of public knowledge of the proposed highway project.

Source: Federal Highway Administration, 1976.

24 CFR 52.103(c)), and some state and local regulations use L_{dn} 60 as the criterion. For purposes of this study, impacts will be determined on the basis of the HUD (L_{dn} 65) criterion.

AIRPORT NOISE REGULATIONS (1.3.2)

The Federal Aviation Administration (FAA) establishes noise standards for aircraft and sets measures of noise standards around airports.

In 1972 the Air Installation Compatible Use Zone (AICUZ) concept was established as a method to protect local citizens from noise and accident hazards associated with flying activities in the interest of their health, safety, and general welfare, and also to preserve the operational integrity of airfields. Applications of the AICUZ method and its acceptance by local communities indicate that it is a rational standard for airfield environs compatible with land use planning.

This concept is a system for identifying and assessing nearby land use compatibility to airfield operations. Part of the AICUZ methodology is to develop noise zones produced by computerized Day-Night Average Sound Level (L_{dn}) contouring programs.

Nearly all studies on residential/aircraft noise compatibliity recommend no residential uses in noise zones above Day-Night Average Sound Level (L_{dn}) 75. Usually no restrictions are recommended below L_{dn} 65. Between L_{dn} 65-75 there is currently no consensus, with special noise control construction required for approval in most areas. Wherever possible, residential use should be located below L_{dn} 65 consistent with the HUD criterion.

Most industrial/manufacturing uses are compatible with the airfield environs. Exceptions are uses such as research or scientific activities, which require lower noise levels. Noise level reduction measures are recommended for buildings devoted to office use, for receiving the public, or where normal background noise level is low.

Transportation, communications, and utilities have a high noise land use compatibility because, except for construction and maintenance, they are not populated.

Commercial/retail trade, and personal and business services categories are compatible without restriction up to L_{dn} 70, but are generally incompatible above L_{dn} 80. Between L_{dn} 70-80, noise level reduction measures should be included in the design and construction of buildings.

Most uses in the public and quasi-public services category require a quieter environment, and attempts should be made to locate these in areas with a L_{dn} below 65, or else to provide adequate noise level reduction measures.

Although recreational use has often been recommended as compatible with high noise levels, recent research has resulted in a more conservative view. Above L_{dn} 75, noise becomes a factor which limits the ability to enjoy such uses. Where the requirement to hear is a function of the use (music shell, etc.), compatibility is limited. Buildings associated with golf courses and similar uses should be noise attenuated.

With the exception of forestry activities and livestock farming, uses in the resource production, extraction, and open space category are compatible almost without restriction. However, in extreme cases, the effects of high noise levels on wildlife should be considered (see Appendix F).

Land use guidelines have been established on the basis of studies prepared or sponsored by several federal agencies, including the Department of Housing and Urban Development, the Environmental Protection Agency, the U.S. Air Force, and state and local agencies. These agencies have also prepared Land Use Compatibility Guideline tables, which are useful in determining impacts on different types of land uses for different L_{dn} noise levels. Tabular listings of Land Use Compatibility Guidelines are included for reference in Appendix C.

2.0 TRAFFIC NOISE STUDY

2.1 GENERAL TRAFFIC NOISE PARAMETERS

Traffic noise depends on three types of parameters:

1. Traffic parameters: Number of vehicles per hour, type of vehicles, and average speed of each type of vehicle. Analysis of idealized systems show that when the density of vehicles per unit length is sufficiently high, that the sideline noise for the automobiles increases linearly with traffic volume and approximately to the third power of the average speed. On the other hand, under the same conditions, the noise from trucks increases linearly with volume flow but less rapidly with the increase in average speed. This is because the noise from trucks is primarily related to the engine and exhaust systems, which are less directly related to vehicle speed than tire noise, which is the dominant component in high speed automobile noise.

2. Roadway parameters: Numbers of interruptions, stop signs, traffic lights. Experiments have shown that a number of interruptions, stop signs, and traffic lights can increase the L_{10} by approximately two dBA for autos and four dBA for trucks, but does not increase the L_{50} significantly. Pavement characteristics have a marked effect, with a range of ten decibels between very smooth, seal-coated, asphalt pavement and rough asphalt or grooved concrete pavement. Gradient adjustments range from zero decibels for less than a two percent grade to a five decibel increase for a gradient of seven degrees or more. Vertical configuration and number of lanes can attenuate the noise level by up to 15 decibels.

3. Observation characteristics: The type of terrain between the observer and the roadway; whether buildings, barriers, or vegetation are present. High, solid barriers can attenuate sounds by 15 decibels. Houses can reduce the sound by three to five decibels per rdw. Distance and elevation of the receptors relative to road and ground level, and thermal and wind gradient, influence refraction of sound energy.

In order to determine the magnitude of increased traffic noise as a result of the M-X system, peak hour L_{eq} contours (approximately equal to L_{dn} per HUD regulations) have been calculated for affected roadways surrounding each of the prospective bases. Contours from 45 dBA (essentially no impact) to 70 dBA (serious impact on residential uses) have been calculated in 5 dBA increments and are shown in Table 2.1-1.

The noise contour computations were based upon the methods of the widely accepted FHWA2 Highway Traffic Noise Prediction Model (1978). The FHWA model uses reference levels of noise energy emitted from three classes of vehicles (automobile, medium truck, and heavy truck) for its basic source terms. The reference levels have been determined from extensive field measurements. To predict the A-weighted sound level at various distances from mixtures of moving sources, the FHWA model adds to the basic reference levels various adjustment

Table 2.1-1. Traffic noise contours (Page 1 of 2).

Location	Average Daily Traffic	Distance to L_{eq} Contours in Meters 45 dBA	50 dBA	55 dBA	60 dBA	65 dBA	60 dBA	L_{eq} in dBA at 15 Meter
Beryl, Utah								
State 56. West of Cedar City	670[1]	338	183	82	33	--[4]	--	64
	940[2]	400	220	108	43	18	--	66
	5,900[3]	841	532	318	167	75	32	74
State 56. Beryl Junction to Newcastle	460	275	145	60	22	--	--	62
	940	400	220	108	43	18	--	66
	6,890	890	570	345	185	84	32	74
State 18. Beryl Junction to Enterprise	460	275	145	60	22	--	--	62
	650	335	180	80	32	--	--	64
	3,240	665	418	233	114	46	18	71
State 56. West of Modena	290	220	105	43	15	--	--	60
	650	335	180	80	32	--	--	64
	1,130	440	245	120	49	18	--	66
Clovis, New Mexico								
U.S. 84. West of Clovis	2,560	610	375	205	96	39	15	70
	13,120	1,120	730	465	265	135	56	77
	21,290	1,320	890	570	345	185	84	79
Coyote Spring, Nevada								
I-15, Las Vegas to Garnet	6,685	880	565	341	182	82	32	74
	8,950	980	627	385	212	103	42	75
	17,620	1,230	830	530	310	165	73	78
U.S. 93	565	350	185	84	34	--	--	64
	850	390	210	100	40	15	--	65
	8,210	940	610	375	205	96	39	75
Dalhart, Texas								
Base to H. County Road	90	105	42	15	--	--	--	55
	100	110	45	18	--	--	--	56
	2,900	640	400	220	105	43	15	70
U.S. 54. Base to Dalhart	1,830	530	318	168	75	26	--	68
	1,890	540	322	171	76	32	--	69
	9,830	1,010	650	410	225	110	44	76
U.S. 87, Dumas	2,380	590	360	191	90	36	15	70
	2,450	595	365	193	92	36	15	70
	5,770	840	530	315	165	74	26	73

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Table 2.1-1. Traffic noise contours (Page 2 of 2).

Location	Average Daily Traffic	Distance to L_{eq} Contours in Meters 45 dBA	50 dBA	55 dBA	60 dBA	65 dBA	60 dBA	L_{eq} in dBA at 15 Meter
Delta, Utah								
U.S. 6 and U.S 50. Northwest of Base	530	300	156	68	26	--	--	63
	740	350	190	87	35	15	--	65
	9,080	990	630	390	215	105	42	75
U.S. 50. West of Delta	3,300	670	420	235	115	46	18	71
	4,580	765	490	280	147	60	22	72
	12,210	1,080	710	450	252	126	52	77
U.S. 50. East of Delta	620	325	175	77	31	--	--	64
	860	390	210	100	40	15	--	65
	2,990	644	403	222	107	44	18	71
Ely, Nevada								
U.S. 93. State 486, Junction to Ely	820	375	205	96	39	15	--	65
	1,720	525	310	165	72	26	--	68
	9,960	1,020	660	415	225	112	45	76
U.S. 93. North of Ely	1,720	525	310	165	72	26	--	68
	4,410	750	480	275	142	58	22	72
	6,050	845	535	320	169	76	32	74
U.S. 50. Ely to Ruth	1,510	490	285	150	62	26	--	68
	2,800	630	390	210	103	41	15	70
	4,440	760	485	277	143	59	22	72
Milford Utah								
Milford to Lund County Road	0	--	--	--	--	--	--	0
	0	--	--	--	--	--	--	0
	3,440	680	435	240	120	48	18	71
Milford to Minersville	750	355	191	90	36	15	--	65
	1,350	480	275	143	59	22	--	67
	3,530	690	440	243	122	49	18	71
Minersville to Cedar City	260	205	96	39	15	--	--	60
	470	280	150	63	26	--	--	63
	1,640	510	300	156	68	26	--	68
Minersville to Greensville	760	355	192	90	36	15	--	65
	1,370	480	275	143	59	22	--	67
	2,570	610	375	205	96	39	15	70

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[1]Existing or most recent traffic count.

[2]1992 traffic volumes without M-X.

[3]1992 Traffic volumes with M-X.

[4]Noise levels are not calculated for distances less than 15 meters.

Source: HDR Sciences, 1981.

factors, based upon theory, that account for multiple noise sources: roadway design features (curvature and number of lanes), absorptive/reflective characteristics of ground cover, physical barriers, etc. For the large number of calculations, mostly generic, required for the M-X analysis, the principal components used from the FHWA model were the reference emission levels and the formulation of the composite source terms representing a mixture of moving vehicles in-line. It was assumed there were no major discrete physical barriers, man-made or natural, to interrupt the flow of sound. Propagation losses over long distances were characterized by attenuation factors based upon the analyses of Chapter 7, Sound Propagation Outdoors, (Federal Highway Administration, 1976) as discussed below.

The reference source terms of the FHWA model are expressed as a function of vehicle speed. For automobiles and heavy trucks, the terms are equal to:

$$(L_o)\ \text{Auto} = 38.1 \log (V) - 2.4 \text{ dBA}$$

and

$$(L_o)\ \text{Heavy Truck} = 24.6 \log (V) + 38.5 \text{ dBA}$$

L_o is the reference energy mean emission level measured at 15 m when V is expressed in km/hr.

When the source is a steady stream of traffic, the noise level at the observer is the accumulation from numerous sources at varying distances. The FHWA model accounts for these conditions with the source adjustment factor:

$$\text{traffic flow adjustment} = 10 \log \frac{(N_i \pi D_o)}{V_i T} \text{ dBA where}$$

- N_i is the number of vehicles in the ith class passing in a specified time period (taken equal to one hour for this analysis)
- D_o is the reference distance (15 m) at which the reference emission level was measured
- V_i is the average speed of the ith class of vehicles in km/hr
- T is the time period in which the equivalent sound level is computed (taken as one hour)

The propagation losses are shown (Federal Highway Administration, 1976) to result principally from geometric divergence (wave spreading), and other attenuation (called excess attenuation) due to molecular absorption in the air, diffraction over barriers, attenuation by grass, shrubs, constructive interference of direct and reflected waves, and other physical phenomena which are sometimes poorly defined. Attenuation is a complex function of many factors, which include humidity, temperature, frequency of sound producers, as well as physical features of the terrain. Atmospheric absorption, for example, is shown (Federal Highway Administration, 1976, pp. 171, 186) to vary from about 2dB/km to 20 dB/km for the regime of interest to M-X analyses. The excess attenuation from ground effects is shown to vary widely.

To characterize the propagation losses conservatively, in view of the uncertainties, the judgment was made to limit attenuation to geometric divergence plus excess attenuation of 5dB/km from atmospheric absorption and 4dB/km from ground effects. Attenuation from all other causes is ignored. To represent the above propagation losses analytically, for ease of computation, the following expression (accurate within 2dB up to 2,000 m) was constructed:

propagation loss = 10 log A (D) dBA

where $A(D) = \frac{D}{15}^{1.2} + \frac{D}{100}^{3}$

where D is the closest distance (in meters) of observer from the line source.

The hourly equivalent sound level (L_{eq}) at a perpendicular distance D from the highway can then be calculated for each class of vehicles from:

$$L_{eq} = \text{Reference Emission Level} + \text{Traffic Flow Adjustment} - \text{Propagation Losses}$$

With the choice of V equal to 80 km/hr (55 mph) and N_i, the peak hourly traffic, equal to 15 percent of the Average Daily Traffic, the expression for L_{eq} reduces to:

$$(L_{eq})_{auto} = 10 \log (ADT)_{auto} - 10 \log (A(D)) + 29.6 \text{ dBA}$$

$$(L_{eq})_{h.t.} = 10 \log (ADT)_{h.t.} - 10 \log (A(D)) + 44.8 \text{ dBA}$$

With the judgment that, on the average, the traffic flow consists of approximately 10 percent heavy trucks and 90 percent automobiles, the L_{eq} can be readily computed for both classes of vehicles. The total hourly equivalent sound level is then obtained from:

$$L_{eq} = 10 \log \left[10^{\frac{L_{eq\,auto}}{10}} + 10^{\frac{L_{eq\,h.t.}}{10}} \right] \text{ dBA.}$$

2.2 SECONDARY SOURCES OF NOISE

M-X construction and increased railroad activities are two potential noise sources.

CONSTRUCTION NOISE (2.2.1)

During construction, heavy equipment operation would have a noise impact on the surrounding area. Construction activities would include clearing, excavation, earth moving, grading, compacting, paving, aggregate, and batch plant operation, and various building work. From the nature and size of the construction areas, it has been estimated that the following equipment could be operated simultaneously within a moderately confined region:

Water Truck
Medium Bulldozer
Compactor
Heavy Bulldozer with Ripper
Scraper

Based on the maximum noise level given by the EPA (Table 2.2.1-1) for these types of equipment, construction noise can be characterized as emitting approximately 97 dBA at 15 m from the principal source. The sound level L_R at any

Table 2.2.1-1. Typical noise levels of principal construction equipment.

NOISE LEVEL IN dBA AT 50 FEET			
Clearing:			
Bulldozer	80	Pneumatic tools	81-98
Front loader	72-84	Bulldozer	80
Dump truck	83-94	Front loader	72-84
Jack hammer	81-98	Dump truck	83-94
Crane with headache ball	75-87	Paver	86-88
Excavation and earth moving:		Grading and Compacting:	
Bulldozer	80	Grader	80-93
Backhoe	72-93	Roller	73-75
Front loader	72-84		
Dump truck	83-94	Paving:	
Jack hammer	81-98	Paver	86-88
Scraper	80-93	Truck	83-94
		Tamper	74-77
Construction:			
Crane	75-87	Landscaping and clean-up:	
Welding generator	71-82	Bulldozer	80
Concrete mixer	74-88	Backhoe	72-93
Concrete pump	81-84	Truck	83-94
Concrete vibrator	76	Front loader	72-84
Cement and dump trucks	83-94	Dump truck	83-94
Air compressor	74-87	Paver	86-88

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Source: U.S. Environmental Protection Agency, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," NTID 300.1, December 31, 1971.

other radial distance R, assuming uniform divergence from a point source, can be obtained from the relation

$$L_R = L_{15} - 20 \log_{10} \frac{R}{15} - A_e$$

Where L_{15} is the sound level at the reference radial distance of 15 m (R_{15}) and A_e is the excess attenuation discussed previously. For an excess attenuation, A_e, limited to 5 dB/km due to atmospheric absorption and 4 dB/km for ground effects, the sound level from the construction site can then be determined to be 65 dBA at 400 m and 45 dBA at 1,400 m. Because of the remote site locations, these sound levels would not constitute a serious noise impact on any inhabited area.

Through the public hearing process, concern was expressed that "noise is a significant factor in precluding wildlife use of adjacent habitat. Noise contributes to temporary and permanent displacement, and if sustained, may result in population losses."

Noise generated by major construction activities would generally last less than one year at any one shelter site. The effects of shelter construction noise on the animals domestic and wildlife in the area should be minor. However, at this time the impact on animal life has not been determined.

Noise would also be generated during construction by traffic of equipment and personnel along the DTN. A typical traffic volume during the peak construction period (reference ETR-19) would be 5,000 vehicles per day (30 percent heavy trucks and 70 percent automobiles). This volume assumes cast-in-place construction methods, irrigation for revegetation around protective structures only, and assembly and check-out personnel traffic. The noise contours calculated according to methods of Section 2.1 are presented in Table 2.2.1-2.

Because of the remote locations and sparse population of construction areas, it is expected that noise generation at all locations would have minimal impact upon the people in the area.

Because wilderness areas that have unusually quiet ambient noise levels (Refer to ETR-18) are in the vicinity of some M-X deployment areas, it is of interest to examine the possible long-range propagation of sound from M-X activities to these quiet areas. Ambient noise in the wilderness regions is reported by the EPA ("Levels" Document, 1978) to have an L_{dn} of about 35 dB. Calculations of the noise level contours from the heavy traffic along the DTN and around the construction sites, which were discussed previously, have been extended to 35 dBA, and the results are shown in Table 2.2.1-3. The noise attenuation is limited essentially to geometric divergence plus excess attenuation of about 9 dB/km as discussed previously. The attenuation can be described as characterizing a "low attenuation" path.

Because the propagation losses over such long pathways depend significantly on the properties of the intervening medium, it is helpful to examine a possible upper limit for the propagation range. For a "worst-case" analysis, the assumption is made that propagation losses would result only from geometric divergence as the wave front expanded, plus a very minimum atmospheric absorption of 2 dB/km. The distances for propagation under such "very low attenuation" conditions have been

Table 2.2.1-2. Typical construction traffic noise from DTN during peak construction period.

5,000 AVERAGE DAILY TRIPS 30% HEAVY TRUCKS	
L_{eq}	DISTANCE (METERS)
45	1,031
50	672
55	414
60	234
65	113
70	47
76	15

3172

Source: HDR Sciences, 1981

Table 2.2.1-3. Long-range noise propagation during peak construction.

L_{eq} (dBA)	Low Attenuation	Very Low Attenuation
Distance from Roadway (meters)[1]		
50	672[2]	2,200[3]
45	1,030[2]	3,600[3]
40	1,550[2]	5,200[3]
35	2,300[2]	7,000[3]
Radial Distance from Site (meters)[4]		
50	1,100[5]	2,000[6]
45	1,400[5]	3,000[6]
40	1,750[5]	4,000[6]
35	2,100[5]	5,400[6]

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[1]DTN (5,000 average daily trips, 30 percent heavy trucks).

[2]Attenuation = $10 \log \left(\frac{D}{15}\right)^{1.2} + \left(\frac{D}{100}\right)^{3}$ dBA

[3]Attenuation = divergence from line source + 2 dB/km.

[4]Construction site (97 dBA at 15 meters).

[5]Attenuation = point source divergence + 9 dB/km.

[6]Attenuation = point source divergence + 2 dB/km.

Source: HDR Sciences calculation, 1981..

calculated and are shown in Table 2.2.1-3. The distances are seen to be two to three times as great as under "normal attenuation conditions." The likelihood of such long-range propagation can be determined only after site specific analyses in subsequent tier studies. The significance of the temporary noise intrusion into wilderness areas is discussed in ETR-18.

RAILROAD NOISE (2.2.2)

During project construction, some materials would be transported to the sites by rail, resulting in increased noise along the railroad right-of-way. Railroad noise can be divided into three components:

1. Transient, predominantly low frequency sound from the locomotive engines

2. Continuous, broad band noise, primarily from wheel/track interaction.

3. Transient noise from the crossing warning horn

The EPA regulates noise by setting maximum in-use noise standards applicable to trains operated by interstate rail carriers. A summa.y of some of the standards is shown in Appendix D.

During peak construction, approximately 160 cars, or four 40-car trains, are estimated to arrive weekly at the construction depots. Since there are two construction areas, only two trains a week would impact a single area. The increase in noise level as a result of this infrequent schedule is expected to be minor.

2.3 TRAFFIC NOISE LEVELS IN THE VICINITY OF THE OPERATING BASES

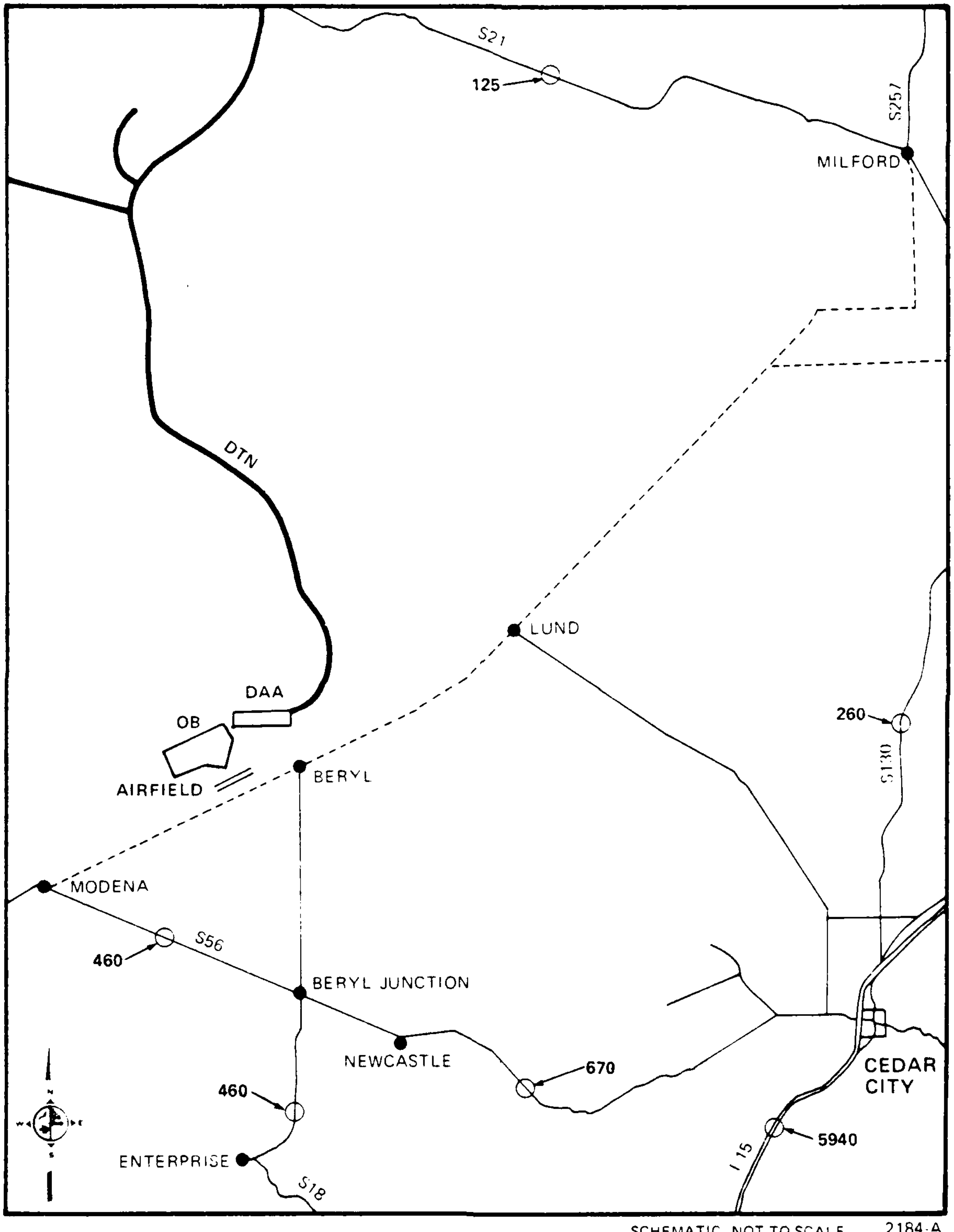
Traffic volume maps were developed for the vicinity of each potential base site. (See Technical Report on Traffic, ETR-19.) The traffic maps are presented in Figure 2.3-1 through 2.3-14, and show existing or recent traffic counts and projections for the year 1992 with and without the M-X system.

Sound level contours, in meters from the centerline of the road, were calculated for the potential base sites using sound levels from 45 dBA to 70 dBA in five dBA increments. Results are presented in Table 2.1-1. In the last column, the L_{eq} at fifteen meters is given for each case.

COMPARISON OF BASE SITES. The following summarizes the noise impacts in the areas of the six prospective M-X sites with regard to the 65 dBA criterion. This level was chosen because, if levels in residential areas exceed 60 dBA, the possibility of negative reactions are greater, and above 65 dBA, levels will exceed HUD and some local noise criteria.

Beryl, Utah:

Western Cedar City - Widening of 65 dBA contours from 18 to 75 m, with respect to the road centerline of State 56, could impact residences bordering the highway.



LEGEND 000 - 1978 TRAFFIC VOLUMES, BERYL, UTAH

SOURCE: UTAH DEPARTMENT OF TRANSPORTATION

Figure 2.3-1. 1978 traffic volumes, Beryl, Utah

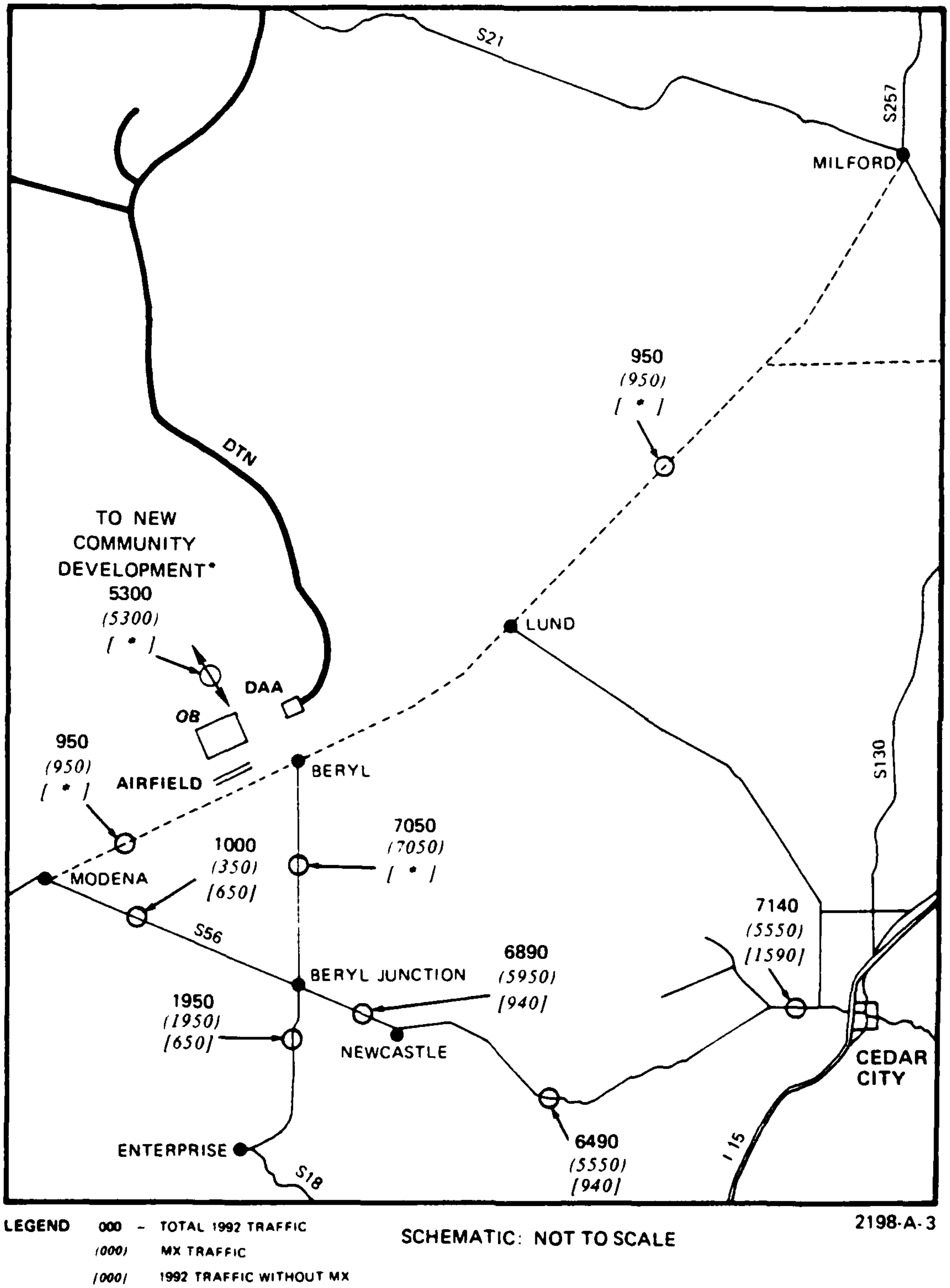


Figure 2.3-2. 1992 traffic volumes, Beryl, Utah
Source: HDR Sciences, 1981

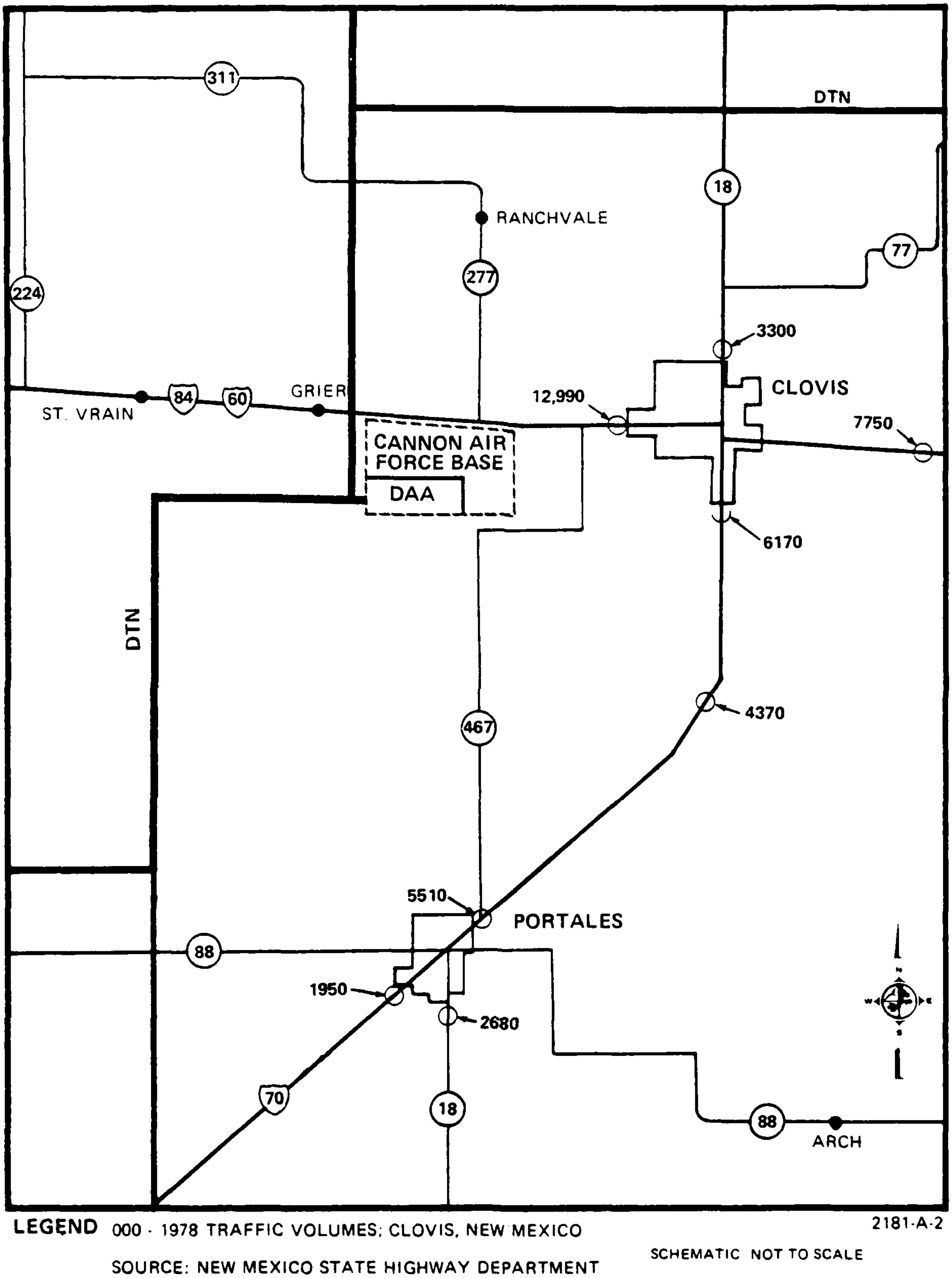
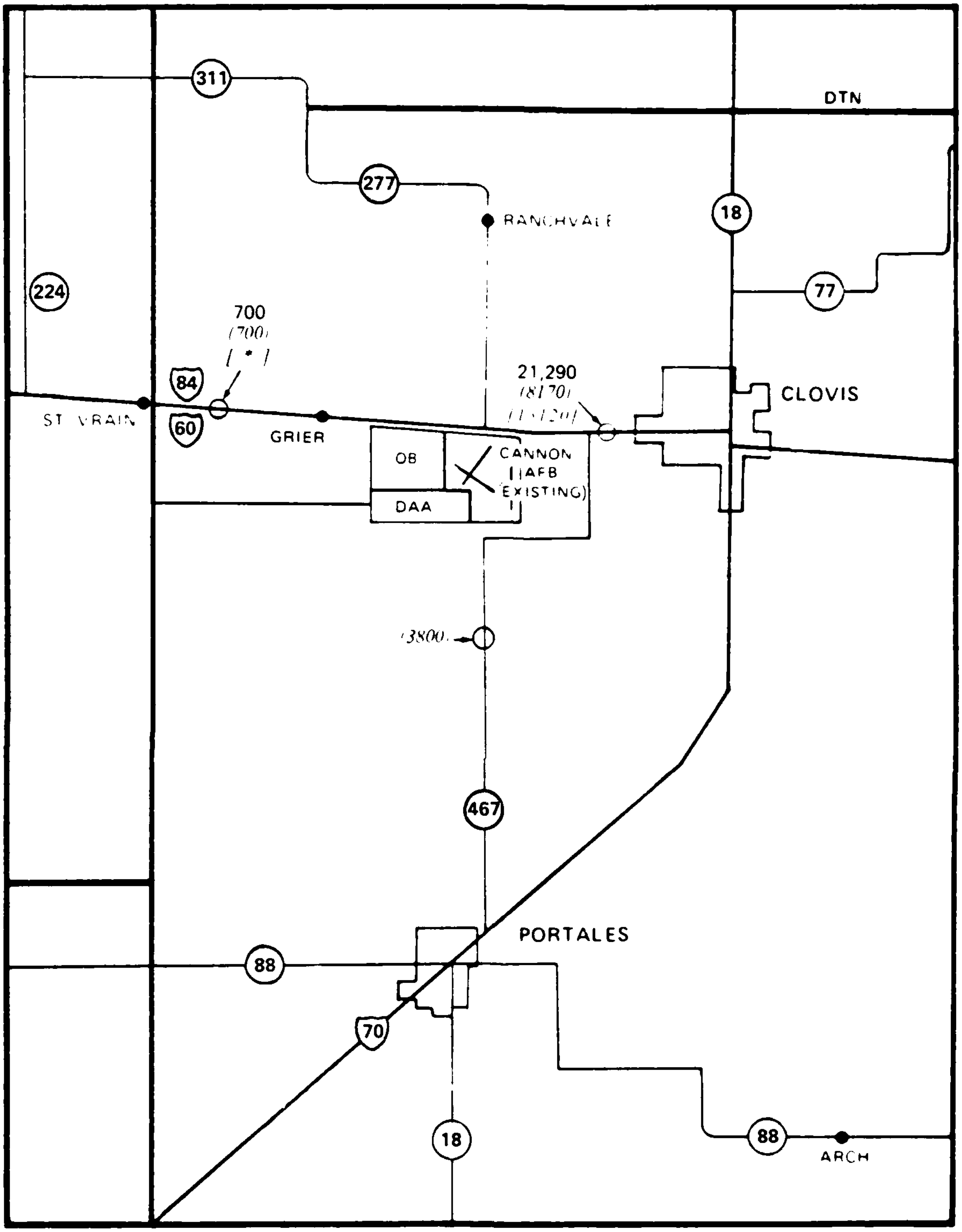


Figure 2.3-3. 1978 traffic volumes, Clovis, New Mexico

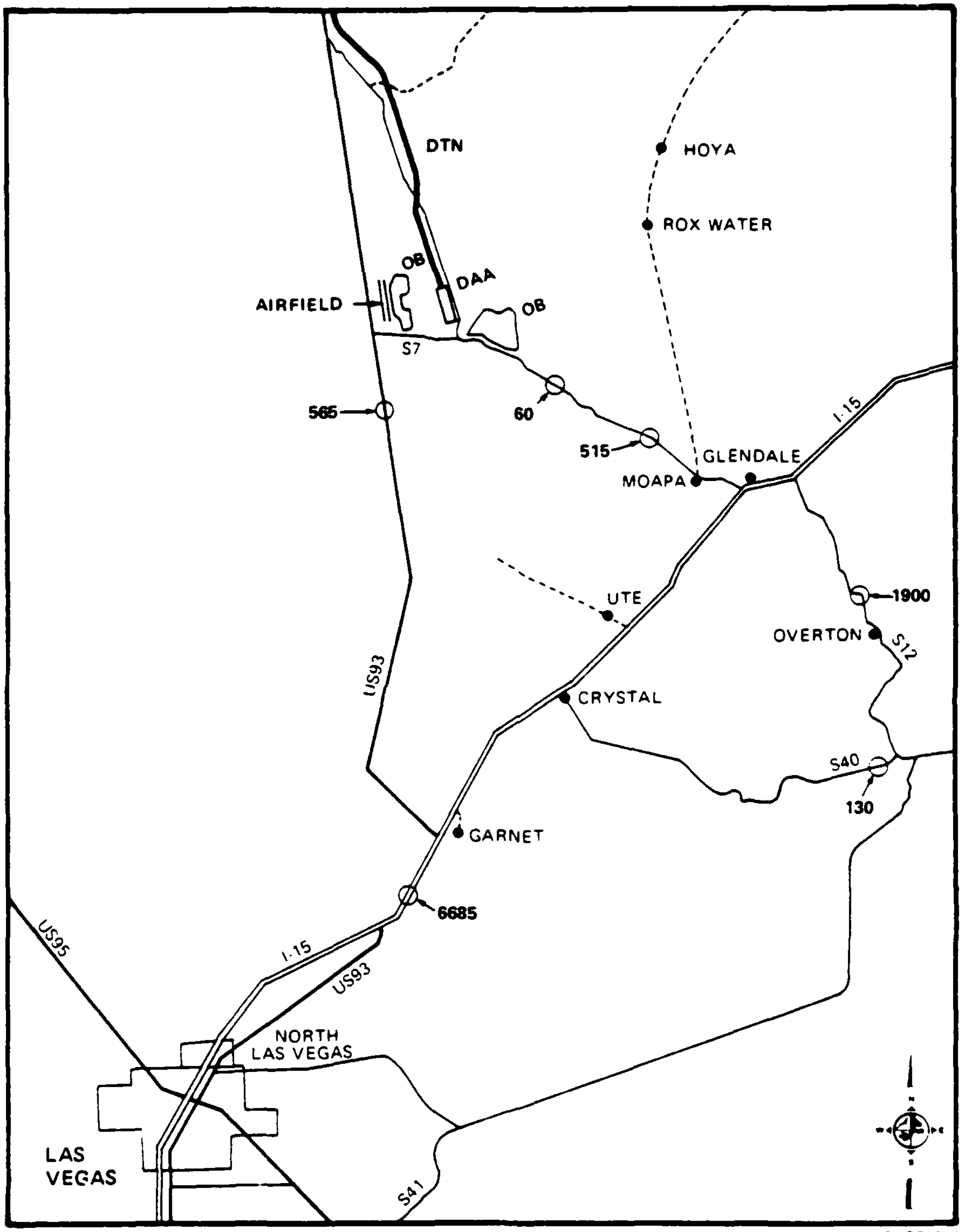


LEGEND 000 TOTAL 1992 TRAFFIC
(000) MX TRAFFIC
[000] 1992 TRAFFIC WITHOUT MX

SCHEMATIC NOT TO SCALE 2192-A-5

Figure 2.3-4 1992 traffic volumes, Clovis, New Mexico

Source: HDR Sciences, 1981



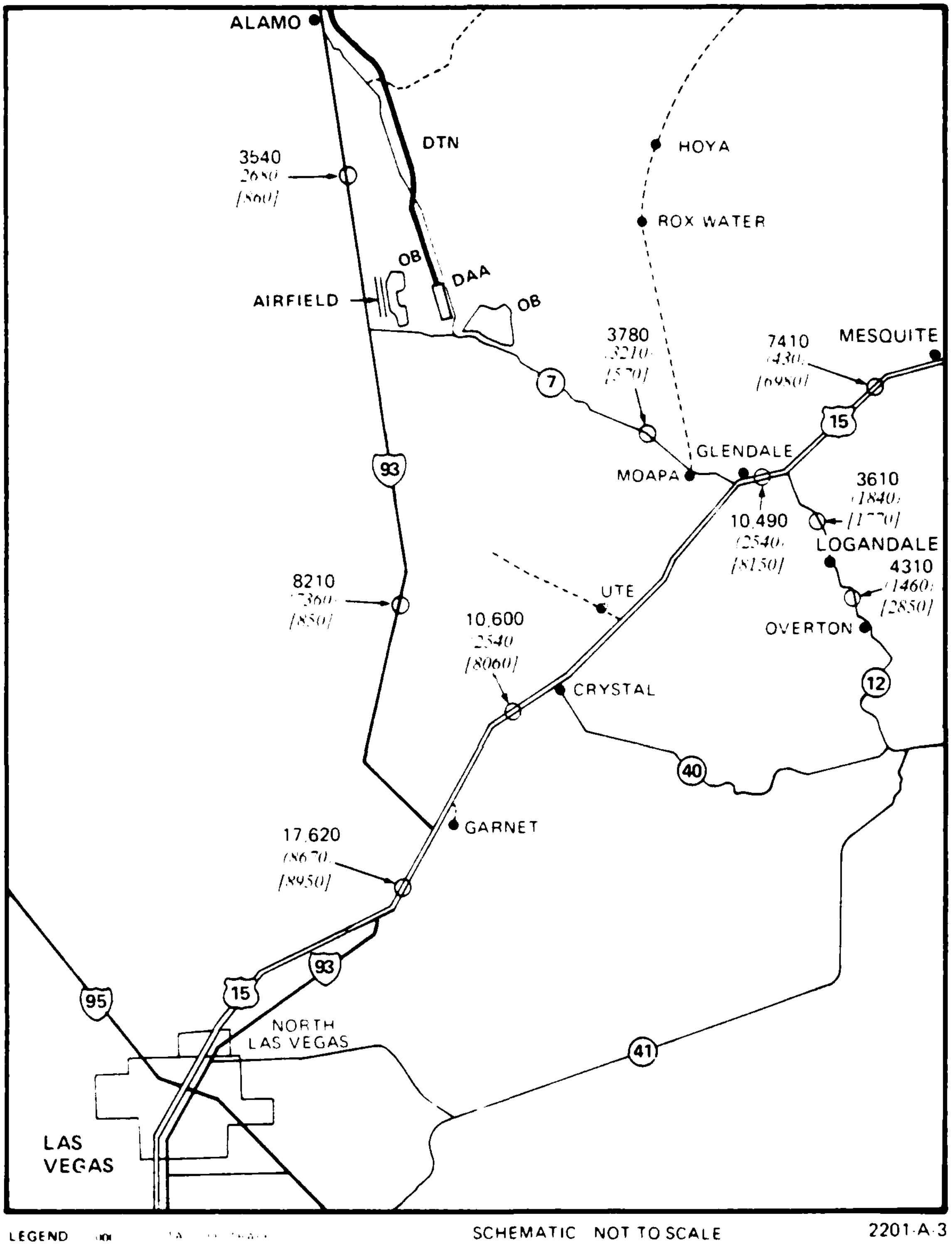
LEGEND 000 - 1979 TRAFFIC VOLUMES; COYOTE SPRING, NEVADA

2183-A-1

SCHEMATIC NOT TO SCALE

SOURCE: NEVADA DEPARTMENT OF TRANSPORTATION

Figure 2.3-5. 1979 traffic volumes, Coyote Spring, Nevada



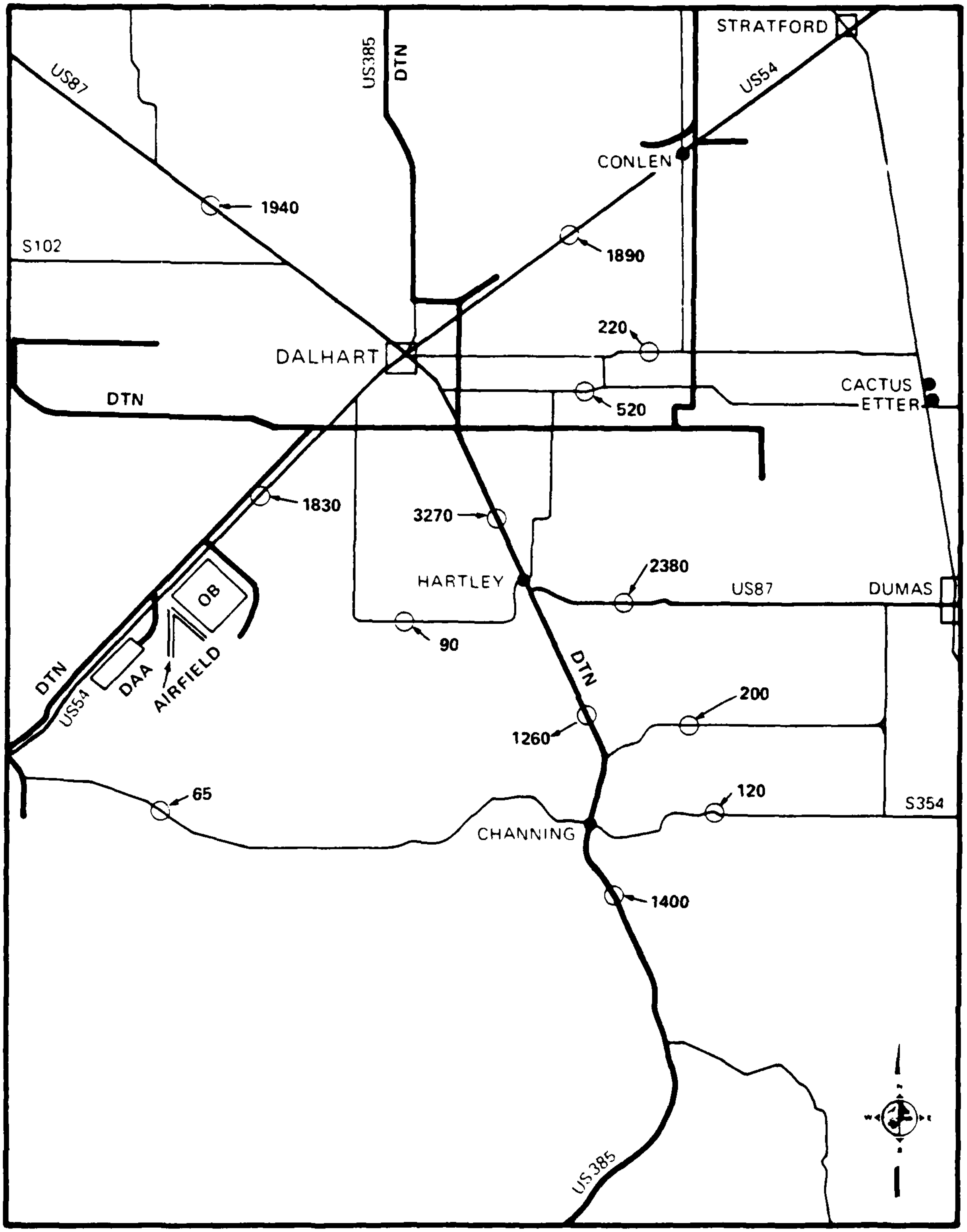
LEGEND

SCHEMATIC NOT TO SCALE

2201-A-3

Figure 2.3-6 1992 traffic volumes, Coyote Spring Valley, Nevada

Source: HDR Sciences, 1981



LEGEND 000 - 1975 TRAFFIC VOLUMES, DALHART, TEXAS SCHEMATIC NOT TO SCALE 2180-A-1

SOURCE: TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

Figure 2.3-7. 1975 traffic volumes, Dalhart, Texas

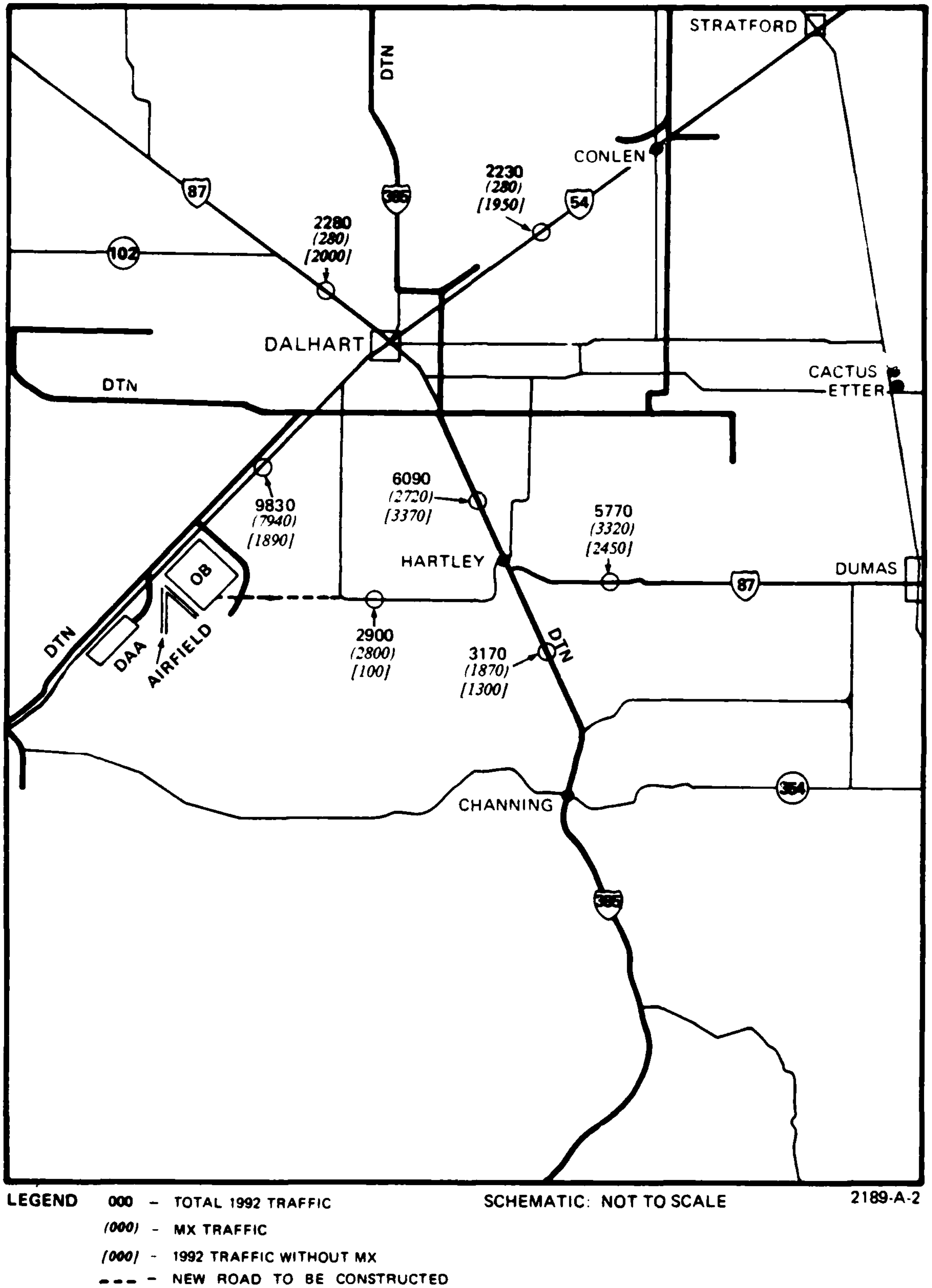
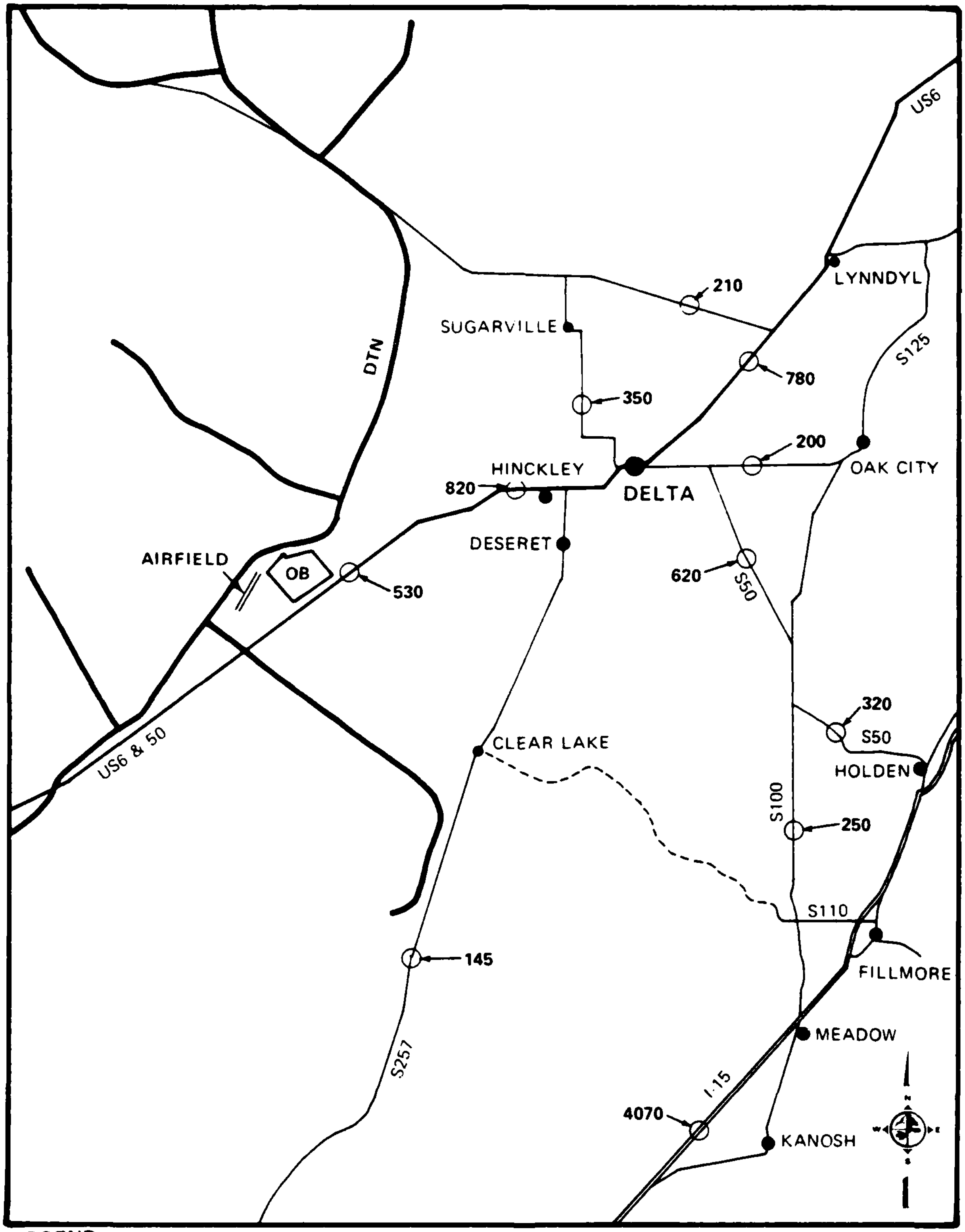


Figure 2.3-8. 1992 traffic volumes, Dalhart, Texas

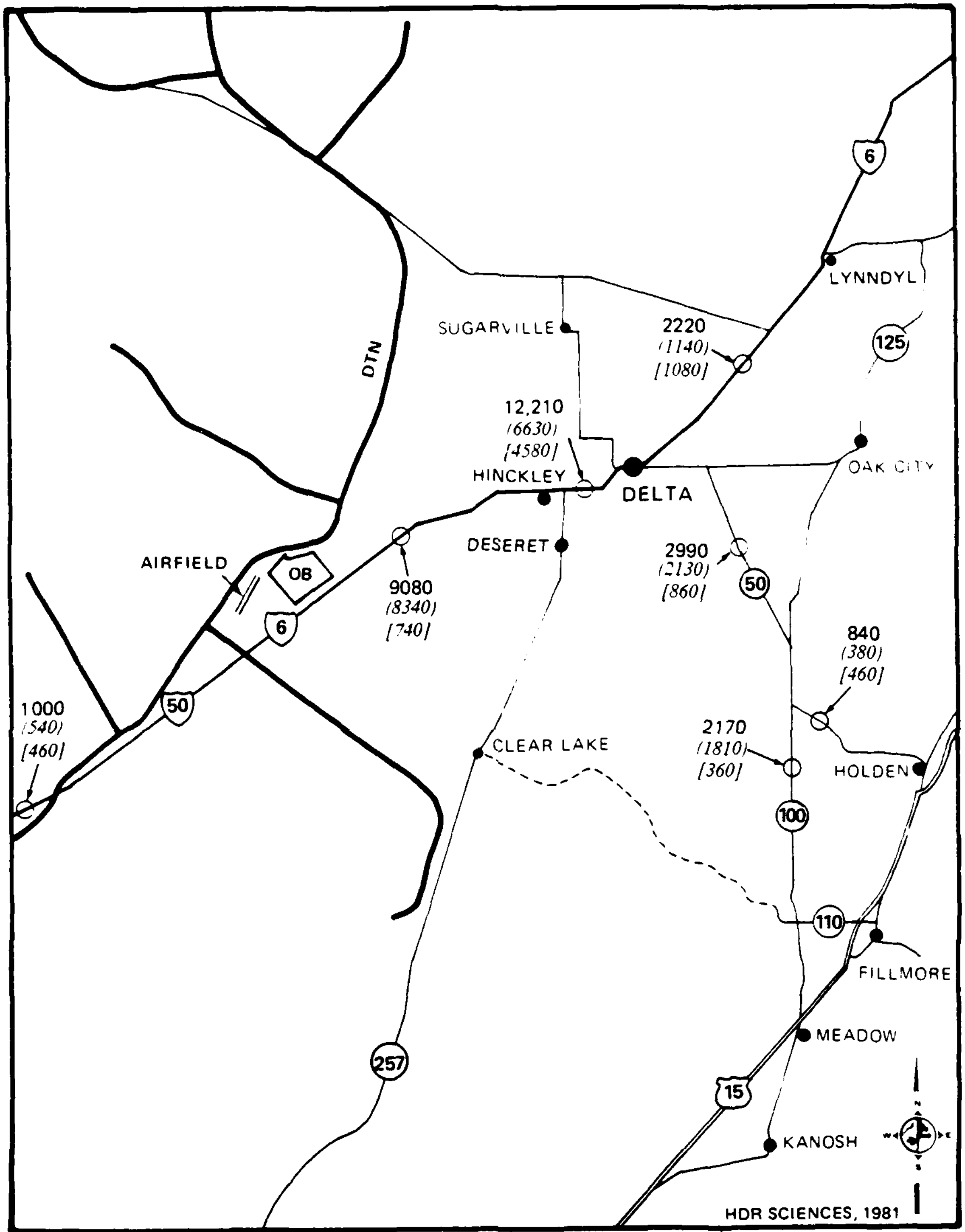
Source: HDR Sciences, 1981



LEGEND 000 - 1978 TRAFFIC VOLUMES; DELTA, UTAH SCHEMATIC - NOT TO SCALE 2182-A-1

SOURCE: UTAH DEPARTMENT OF TRANSPORTATION

Figure 2.3-9. 1978 traffic volumes, Delta, Utah



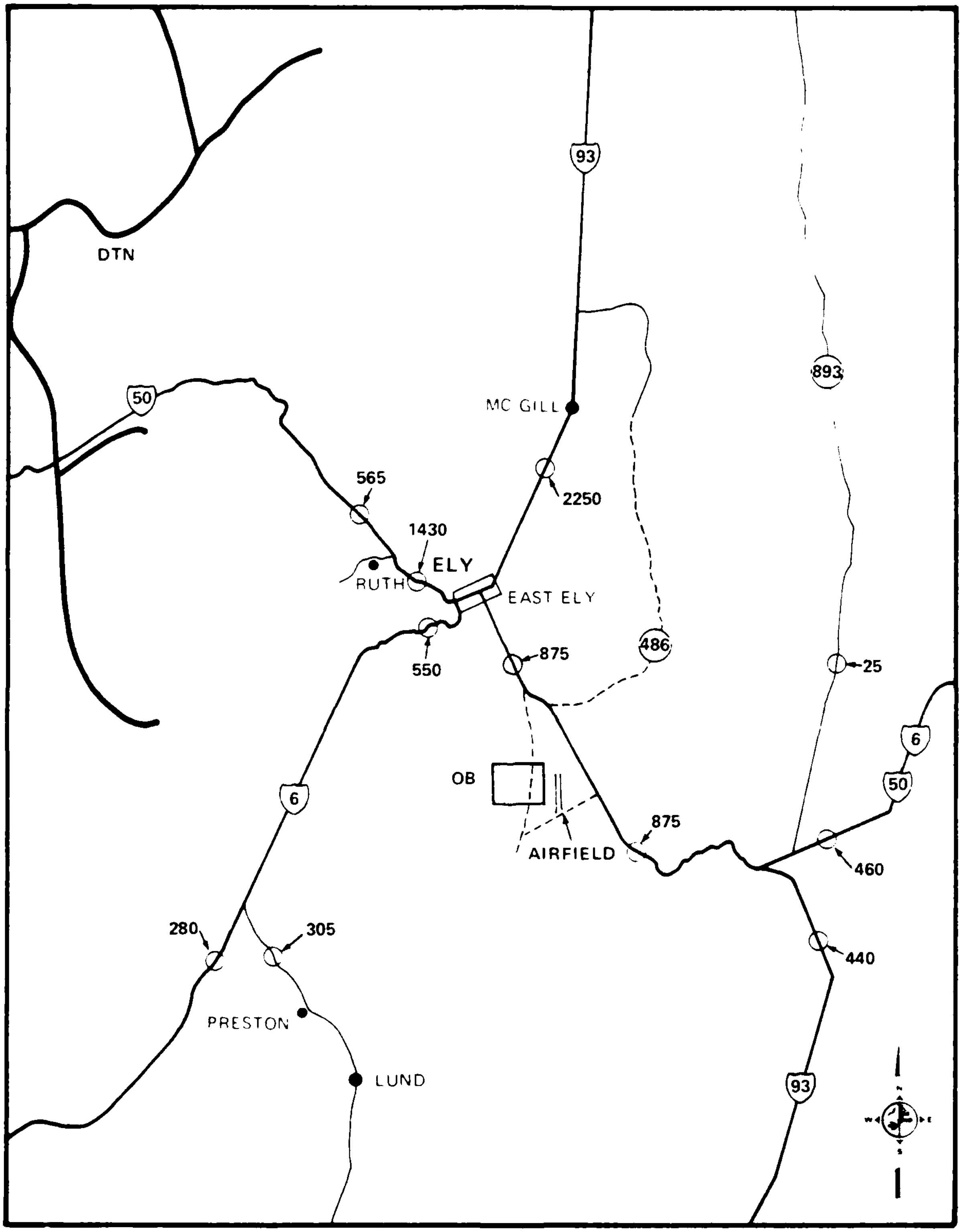
2195-A-3

LEGEND 000 - TOTAL 1992 TRAFFIC
(000) - MX TRAFFIC
[000] - 1992 TRAFFIC WITHOUT MX

SCHEMATIC. NOT TO SCALE

Figure 2.3-10. 1992 traffic volumes, Delta, Utah

Source: HDR Sciences, 1981



LEGEND 000 1980 TRAFFIC VOLUMES; ELY, NEVADA

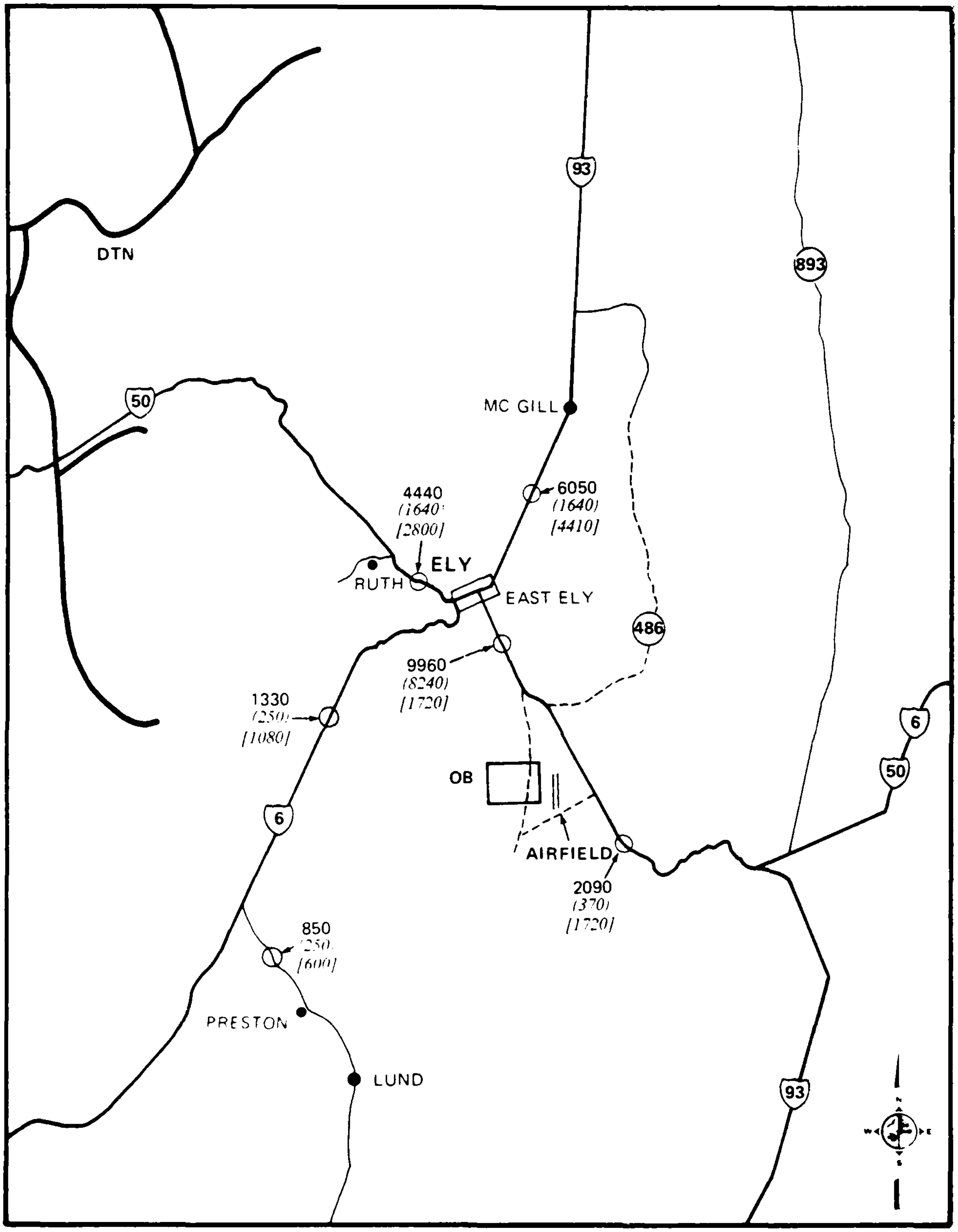
SCHEMATIC NOT TO SCALE

2179-A-1

SOURCE: NEVADA DEPARTMENT OF TRANSPORTATION

Figure 2.3-11. 1979 traffic volumes, Ely, Nevada

Source: HDR Sciences, 1981



LEGEND 000 - TOTAL 1992 TRAFFIC
(000) MX TRAFFIC
[000] 1992 TRAFFIC WITHOUT MX

SCHEMATIC NOT TO SCALE

2186-A-2

Figure 2.3-12. 1992 traffic volumes, Ely, Nevada

Source: HDR Sciences, 1981

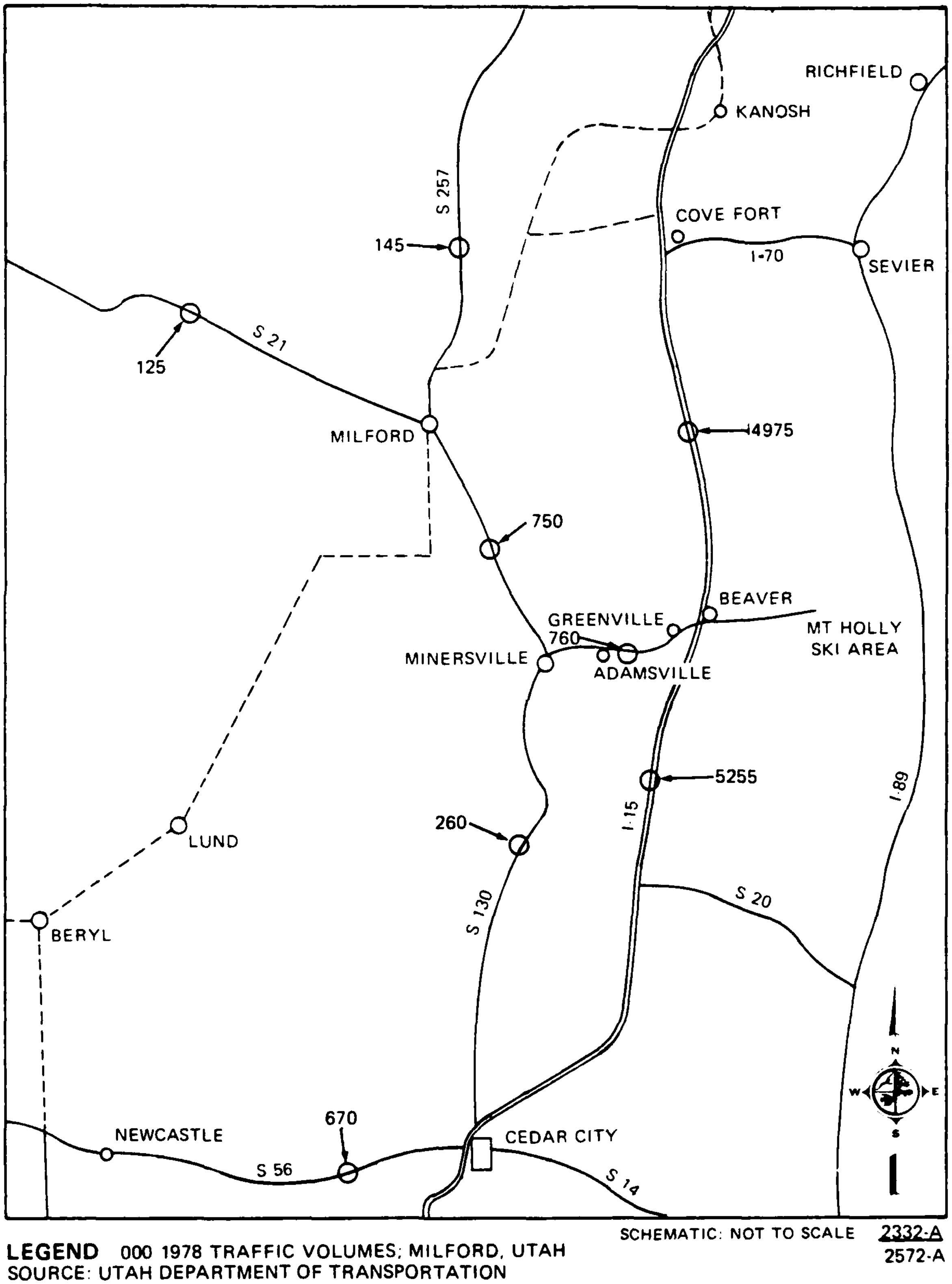


Figure 2.3-13. 1978 traffic volumes; Milford, Utah

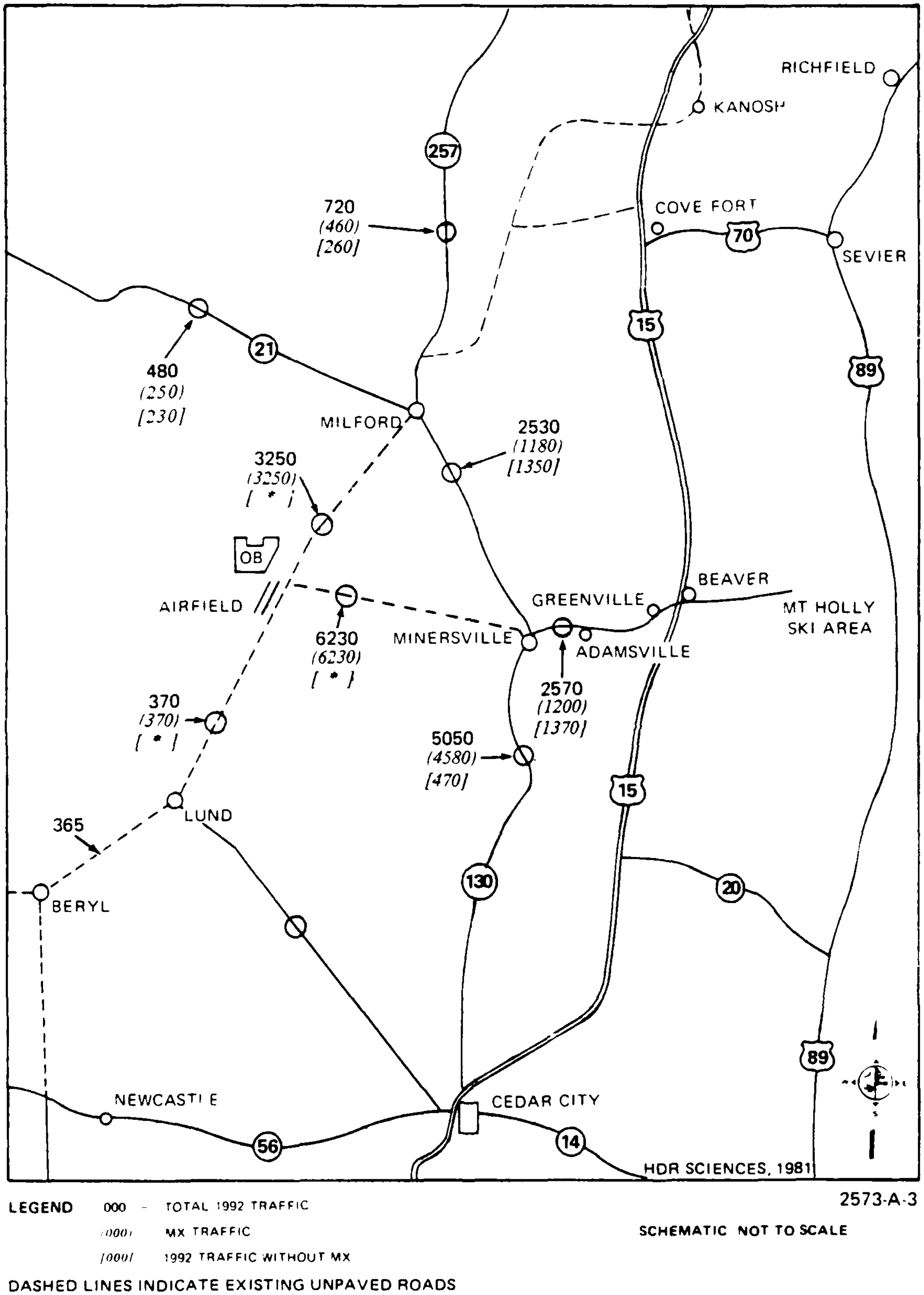


Figure 2.3-14. 1992 traffic volumes, Milford, Utah

Source: HDR Sciences, 1981

Newcastle - Widening of 65 dBA contours from 18 to 84 m would have a noticeable impact on noise sensitive land uses bordering State 56.

Beryl Junction - Widening of 65 dBA contours from 11 to 46 m at the south end of town and to 84 m at the east side of town would impact residences and other noise sensitive uses in these areas. Impacts would be negligible on the west side of town.

Modena - Impacts would be small on residences bordering State 56 within 18 m.

Coyote Spring, Nevada:

North Las Vegas - Widening of 65 dBA contours from 103 to 165 m along I-15, would moderately (4 dBA) impact residential or other noise sensitive land uses near I-15.

U.S. 93 - Approximately 11 dBA increase in noise levels, with 65 dBA contours at 96 m. Negligible impact due to apparent lack of habitation.

Delta, Utah:

Hinckley - Widening of 65 dBA contours from 15 to 105 m, with impact exceeding 70 dBA expected for uses bordering U.S. 6 and 50. Serious impact (11 dBA increase) on residences near the highway.

Western Delta - Widening of 65 dBA contour from 60 to 126 m, with four dBA increase in impact.

Eastern Delta - widening of 65 dBA contour from 15 to 44 m, with strong impact on noise sensitive land uses immediately adjacent to the highway.

Ely, Nevada:

Western Ely - widening of 65 dBA contour from 41 to 59 m along US 50, with moderate noise impact on land uses immediately adjacent to the highway.

Southeastern Ely - Widening of 65 dBA contours from 26 to 112 m, with 9 dB noise increase would have strong noise impact on residences (fewer than 10 units) adjacent to the highway.

Milford, Utah:

To Lund - Currently there is little traffic on this road. A significant impact would occur with the M-X. The 65 dBA contour would be at 48 m.

To Minersville - Widening of 65 dBA contour from 22 to 49 m, with significant increase in noise impact (7 dBA) with M-X project.

To Cedar City - Widening of 65 dBA contour to 26 m, with strong impact on residences near highway.

To Greensville - Widening of 65 dBA contour from 22 to 39 m, with strong impact on residences near highway.

Clovis, New Mexico:

Western Clovis - High traffic noise levels along U.S. 84 would exist with or without M-X system. M-X traffic would increase noise levels approximately 2 dBA.

Southern, Eastern and Northern Clovis - negligible impact.

Portales - Negligible impact.

Dalhart, Texas:

Conlen - Negligible impact.

Southwestern Dalhart - Widening of 65 dBA contour from 32 to 110 m along US 54, with strong (5 dB) impact on residential and other noise sensitive land uses bordering US 54.

Other Dalhart - negligible (1 dB or less) impact.

Hartley - Establishment of 65 dBA contour at 43 m from country road at west side of town would increase noise levels nearly 15 dB, with high likelihood of negative community reaction. Moderate impact on southern and eastern Hartley. Negligible impact on northern Hartley.

Dumas - Widening of 65 dBA contours from 36 to 74 m at west end of town, would moderately impact (3 dB) residences and other noise sensitive land uses bordering US 87.

The above synopsis of noise impacts on the areas surrounding each of the prospective M-X base sites suggests a moderate to high noise increase along most roadways. In many cases, this is because existing traffic volume are extremely low. The result of the added vehicle traffic would be a transformation of the areas from "quiet rural" to "average suburban residential" (45 to 60 dBA) Though impacts have been stated in terms of widened 65 dBA contours and noise level increases, true impacts depend upon noise level effects on the local population. Because of the sparse level of habitation in most areas, a low overall noise impact is expected.

Finally, it must be emphasized that the noise contours as calculated for this report are conservative. Vehicle speeds were assumed constant at 80 km/h, but would probably be less in populated areas. All trucks were considered as "heavy", and the percentage of total traffic allocated to trucks was high.

2.4 TRAFFIC NOISE LEVELS IN THE DDA DURING OPERATIONS

Once construction was completed in the designated deployment area, traffic would be greatly reduced on the DTN and cluster roads. Table 2.4-1 shows the projected annual trips for the entire deployment area. Assuming that about a quarter of the trips would be generated from each of the four ASCs, average daily trips on the DTN would be less than 100 per day, excluding fuel deliveries. Cluster

Table 2.4-1. Operation and support vehicle traffic[1].

Vehicle Type	Origin	Route Destination	Type of Road Utilized	Annual Trips[2] (Average Mi)	Comments
Special Transport Vehicle	OB/DAA	CMF	DTN	160 (400)	Requires 2 escort vehicles
Special Transporter/ Mobile Launcher	PS/CMF	PS/CMF	Cluster roads	1,200 (31)	
Bulldozer (Tractor and Low Bed)	ASC	Cluster barrier	DTN and/or existing roads	140-160	Barrier removal
Crew Bus (Maintenance)	ASC	Cluster	DTN and/or existing roads	1,300-2,800 (100)	Transport field maintenance crew to job
Crew Bus (40-person)	OB/DAA	ASC	DTN and/or existing roads	2,550-3,850 (400)	Five-day duty cycle at ASC
Security Crew Van (2-person)	ASC	Cluster	DTN and/or existing roads	37,230 (100)	Roving patrol replaced every 8 hours
Roving Patrol Vehicle	ASC	Cluster	DTN and/or existing roads	10,400 (200)	Patrol vehicles returned to ASC weekly for maintenance
Gasoline Tank Truck	OB/ASC	ASC	DTN and/or existing roads	TBD[3]	Consumption primarily determined by roving patrol equipment

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[1]Excludes road maintenance and administrative vehicles. This is a preliminary estimate of operations traffic based upon conceptual layouts.

[2]Total M-X basing area round trips.

[3]TBD means To Be Determined following future studies.

Source: The Boeing Co., 1980.

road trip levels would be even less. At this level of activity, the noise impact of operations would be minor.

2.5 TRAFFIC NOISE MITIGATION MEASURES

The Air Force will plan construction activities with consideration for noise impacts. Baffles and mufflers will be installed on vehicles and equipment where feasible, and noise absorption and insulation measures will be utilized in project design. Project roads will be sited with consideration for noise impacts.

In addition to the above measures, noise levels along roads could be reduced by diverting traffic, especially truck traffic, to roads that bypass populated areas. While this measure could be effective, at most locations it is probably not practical. An alternative mitigation would be to shield existing or new structures from external noise sources by acoustical treatment, including sealing off window areas by double paning or replacement with glass block or brick. If this measure is used however, the affected buildings would have to be air conditioned to offset the lack of circulation caused by permanent window closures. Where this is not practical, barrier walls, earth berms, or combinations could be used to break the sound path between the source and the receptor. The barrier would have to have reasonable mass, be impervious to air flow, and block the direct line between the source and the receptor to be effective. These measures may be appropriate if schools, hospitals or other sensitive buildings are located along routes that would experience large volumes of truck traffic.

AIR FORCE PROGRAMS (2.5.1)

Construction activities will be planned in consideration of noise impacts. This will include monitoring noise levels in sensitive areas. Baffles and mufflers will be installed on vehicles and equipment, and noise absorption and insulation measures will be utilized in project design.

Siting of project facilities could minimize the noise impacts on existing residences. Project roads will be sited with consideration of noise impacts. Project facilities will be located to have adequate distance between noise sources and receivers to avoid adverse noise levels.

OTHER MITIGATIONS UNDER CONSIDERATION (2.5.2)

There are additional measures which could be implemented besides those committed to by the Air Force. The need for and the extent of mitigation methods for noise can be determined after later studies which would gather detailed information on topography, type and number of structures, vehicle mixes and speeds, and sound level measurements. Some of the potential mitigation measures may also require further study to evaluate their feasibility.

Noise levels along roads can be reduced by diverting traffic, especially truck traffic, to roads that would bypass populated areas. While the measure could be effective, at most locations it is probably not practical. An alternative mitigation would be to shield existing or new structures from external noise sources by acoustical treatment, including sealing off areas by paning or replacement of windows with glass block or brick. If this measure is used, however, the affected

buildings would have to be air conditioned to offset the lack of circulation caused by permanent window closures. Where this is not practical, barrier walls, earth berms, or combinations could be used to break the sound path between the source and the receptor. A reduction of 10 dBA or more is possible with such a barrier. The barrier must have reasonable mass, be impervious to air flow, and block the direct line between the source and the receptor to be effective. These measures may be appropriate if schools, hospitals or other sensitive buildings are located along routes that would have large amounts of truck traffic.

3.0 AIRPORT NOISE STUDY

3.1 GENERAL AIRPORT NOISE PARAMETERS

Airport noise levels are determined by many factors. Some of the principal ones are listed below:

1. The type of aircraft - number and type of engines
2. Direction of takeoffs and landings
3. Number of takeoffs, landings, and overflights
4. Loading of the aircraft
5. Meteorological conditions, including winds, temperature, and altitude
6. The time of day and distribution of runway use

3.2 AIRPORT OPERATION

Quantities and types of aircraft permanently assigned to operating bases depend upon whether contiguous or split-basing of the missile shelters is selected, as shown in Table 3.2-1. Projected quantities and types of transient aircraft are constant, regardless of the bases selected (Table 3.2-2).

Table 3.2-3 is a summation of the projected and/or expected aircraft types and daily takeoffs and landings on a daytime or nighttime basis. Daytime operations are from the hours of 0700 to 2200. Nighttime operations are from 2200 to 0700. The daytime and nighttime frequency of aircraft operations along with aircraft type is used in the computer program to generate the L_{dn} noise contours around each of the airports.

3.3 NOISE CONTOUR MODEL

The FAA Integrated Noise Model (INM), program No. 3600-16.0.003, provides a conceptually simple method for describing aircraft noise levels near airfields. It includes a determination of the day-night average sound level, L_{dn}, at a number of points surrounding a particular airfield.

Noise data for common aircraft types are included in the program. Standard aircraft operational procedures, specifically takeoffs, utilizing ATA procedures and landings, with maximum certificated flaps settings, have been assigned operational codes.

The FAA Integrated Noise Model User's Guide, FAA Report No. FAA-EQ-76-2, dated March, 1976, U.S. Department of Commerce Bulletin No. AD-A035-062, dated March 1976, was used as a reference and guide for the computer noise model.

Table 3.2-1. Permanently assigned aircraft proposed for each operating base (airfield) for alternatives of contiguous and split basing of missile shelters.

TYPE OF AIRCRAFT	CONTIGUOUS BASING	SPLIT BASING	FREQUENCY
E-3A/707	5	10	103/month
CH-53E(Helicopter)	8	8	8/day

2751

Source: HDR Sciences, 1981

Table 3.2-2. Transient aircraft type, function and frequency expected for each operating base (airfield) for which are alternatives of contiguous and split basing of missile shelters.

TYPE OF AIRCRAFT	FUNCTION	FREQUENCY
C-5	Logistics	1/month
C-9	Medical/Evacuation	2/week
C-141	Logistics	2/week
KC-135A	Refueling	1/month
T-38	USAF Trainer	2/week
T-39	Command Support	4/week
DC-9	Logistics - Air	1/day
727	Logistics - Air	1/day

2752

Source: HDR Sciences, 1981

Table 3.2-3. Summation of projected and/or expected aircraft frequency of daytime and nighttime operations for each operating base (airport).

TYPE OF AIRCRAFT	NO. OF ENGINES	TAKEOFFS		LANDINGS		CLOSED-PATTERN [2] OPERATION
		DAY[1]	NIGHT[1]	DAY[1]	NIGHT[1]	
E-3A/707	4	2	1.43	2	1.43	0
CH-53E (Helicopter)	3	6	2	6	2	0
C-5	4	0.03	0	0.03	0	0
C-9	3	0.26	0	0.26	0	0
C-141	4	0.26	0	0.26	0	0
KC-135A	4	0.03	0	0.03	0	0
T-38	1	0.13	0.13	0.13	0.13	0.13 Day 0.13 Night
T-39	2	0.26	0.26	0.26	0.26	0
DC-9	2	0.50	0.50	0.50	0.50	0
727	3	0.50	0.50	0.50	0.50	0

2753

[1]Day 0700 to 2200 hours; night 2200 to 0700 hours.

[2]Closed pattern refers to non-normal runway approach. These approaches are normally associated with fighter aircraft and are commonly referred to as "combat" approaches.

Source: HDR Sciences, 1981

An analysis of the types of aircraft by frequency of daily flights (Table 3.2-3) shows that the major amount of airfield activity is by aircraft which have either three or four engines. Based on this, all aircraft with three or less engines are considered to have three engines.

Due to the lack of specific noise data for the aircraft, the noise impact from the three-engine CH-53E helicopter is assumed to be equivalent to a four-engine jet for this noise analysis. The flexibility of helicopter approaches and takeoffs adds a further degree of conservatism to the results. Unusual flight patterns are limited to less than one flight per day. Therefore, all approach and takeoff flight patterns are assumed to be straight in and straight out.

For this noise analysis the four-engine aircraft are assumed to be equivalent in noise generation to a Boeing 707-320B and the three-engine aircraft to a Boeing 727-200, both fully loaded. The takeoff procedure is assumed to be equivalent to a standard "ATA take off" and the landing a "maximum certificated flap landing, 3^{o} glide slope." Both are part of the model program's standard library.

Table 3.3-1 is a summation of the parameters, factors and assumption information used for the noise modeling for the airfields. This information along with information specific to the airfields was fed into the computer and resulted in the noise level curves which follow.

3.4 NOISE PLOT RESULTS

Figures 3.4-1 through 3.4-7 are U.S.G.S. maps with noise contours, proposed operating bases, and airfields superimposed on the maps. The shaded area shows where the L_{dn} is greater or equal to 65. The maps show the population areas, ranches, and farms, along with the airfield approach zones. Because the flight tracks are assumed to be straight for both takeoffs and landings, the noise contours are rectangular. The contour extends approximately 5.9 mi from the end of the runway and is approximately 0.8 mi wide.

As can be seen on the maps, care was taken in selecting sites for the proposed operating bases and airfields to avoid creating noise impacts on all but a few scattered ranches and farms.

An alternative approach to noise impact assessment involves development of noise exposure forecast (NEF) contours. The NEF is a technique used by HUD for preliminary noise assessments. Although the preliminary NEF-30 contours shown on the base layouts are greater in aerial extent than the L_{dn} 65 contour, the NEF-30 contour is based on a relatively crude technique and does not reflect the limited frequency of anticipated takeoffs and landings. The NEF-30 analyses does, however, present a worst case noise contour.

BERYL, UTAH - ALTERNATIVES 1, 3 AND 4. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Beryl, Utah is shown in Figure 3.4-1. No farms appear to be within the L_{dn} 65 contour.

CLOVIS, NEW MEXICO - ALTERNATIVES 7 AND 8. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Clovis, New Mexico is shown on Figure 3.4-2. There are several farms and one small town center

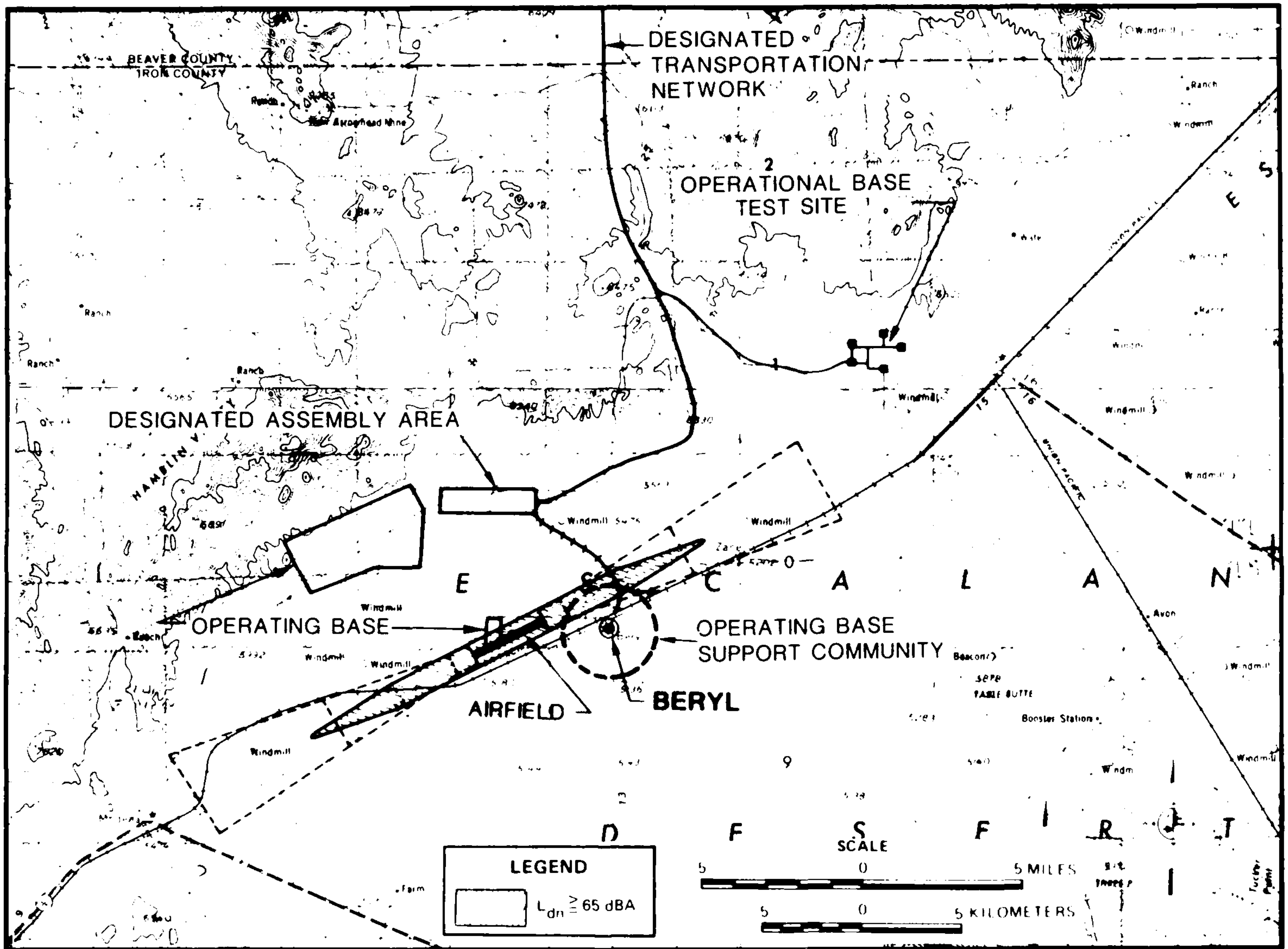
Table 3.3-1. Summation of parameters, factors, and assumptions used for each airfield for noise modeling.

AIRCRAFT	OPERATION	AIRCRAFT[1] CONS.	NO. OF DAYTIME OPERATIONS	NO. OF NIGHTTIME OPERATIONS	TYPE OF APPROACH/ DEPARTURE	USE OF RUNWAYS
4-Engine	Takeoff	B258	8.32	3.43	Straight	Equal
	Landing	B259	8.32	3.43	Straight	Equal
3-Engine	Takeoff	B235	1.65	1.39	Straight	Equal
	Landing	B236	1.65	1.39	Straight	Equal

2754

[1]From Table B-1, Pages B-1 through 8 of FAA Interdated Noise Model Users Guide, FAA Report No. PAA-EQ-76-2, dated March, 1976, U.S. Department of Commerce Bulletin No. AD-A035 062, dated March, 1976.

Source: HDR Sciences, 1981



1247
2556 B 1

Figure 3.4-1. Airport noise contour, Beryl, Utah.

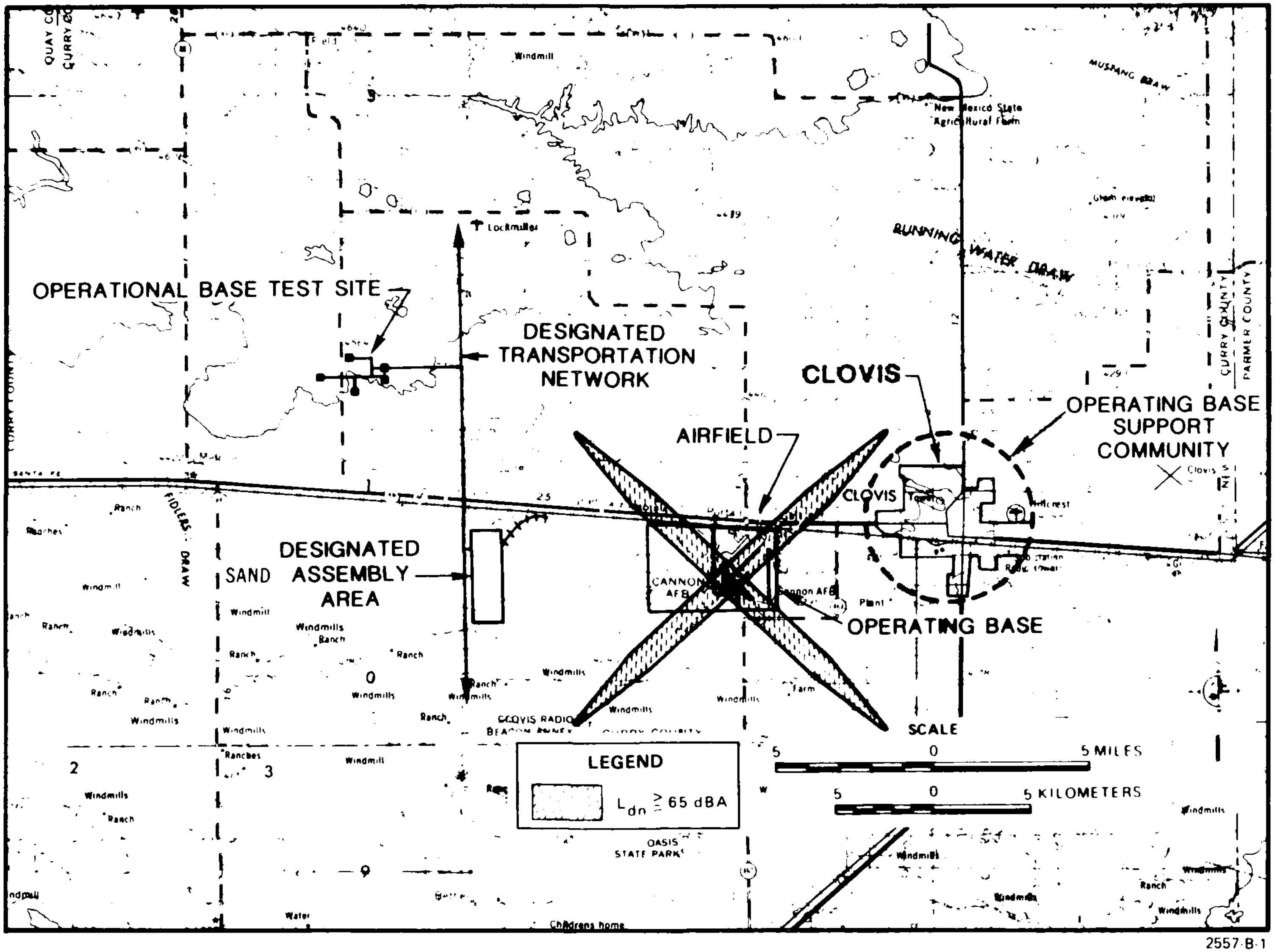
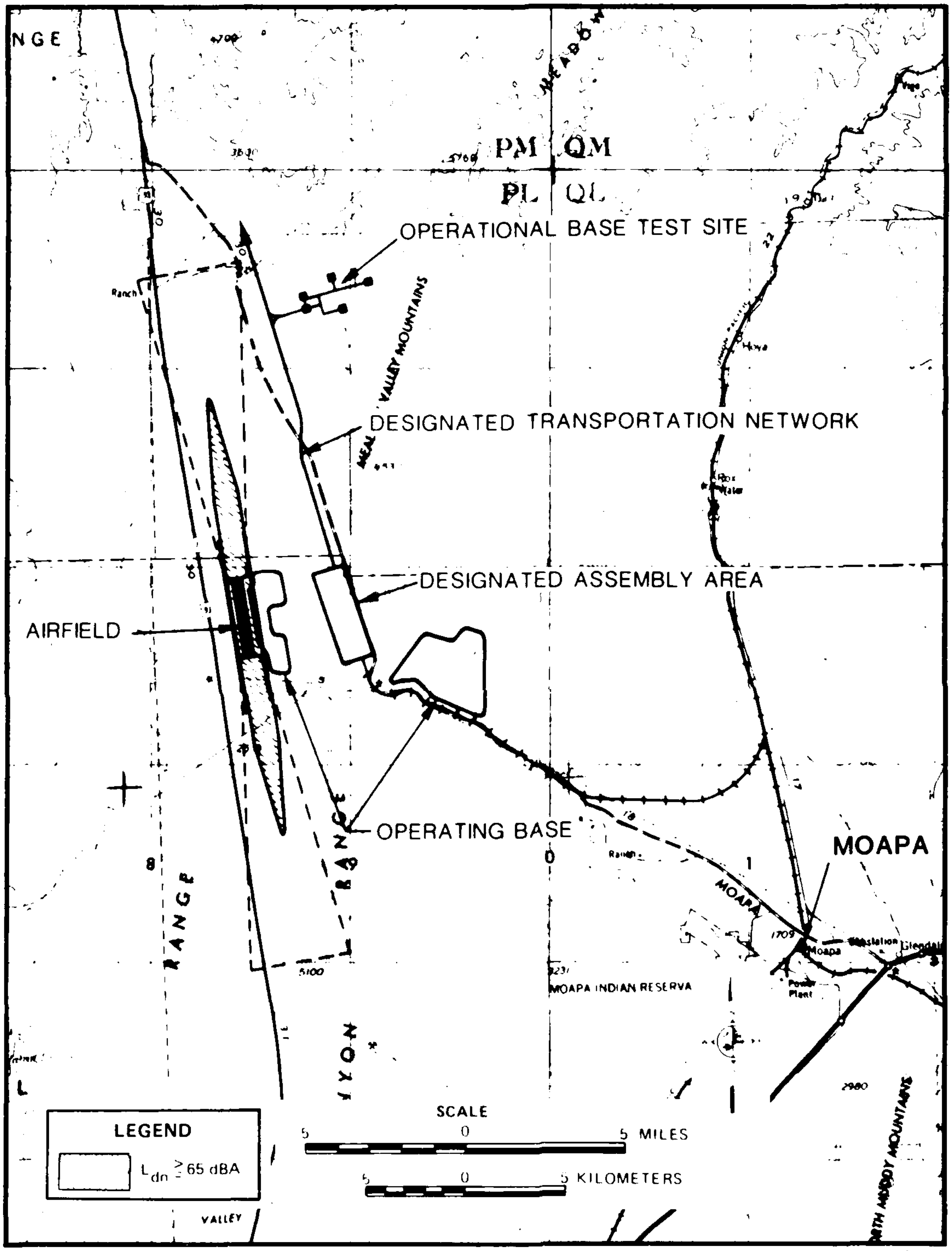


Figure 3.4-2. Airport noise contour, Clovis, New Mexico.



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2558 B 1

Figure 3.4-3. Airport noise contour, Coyote Spring Valley, Nevada.

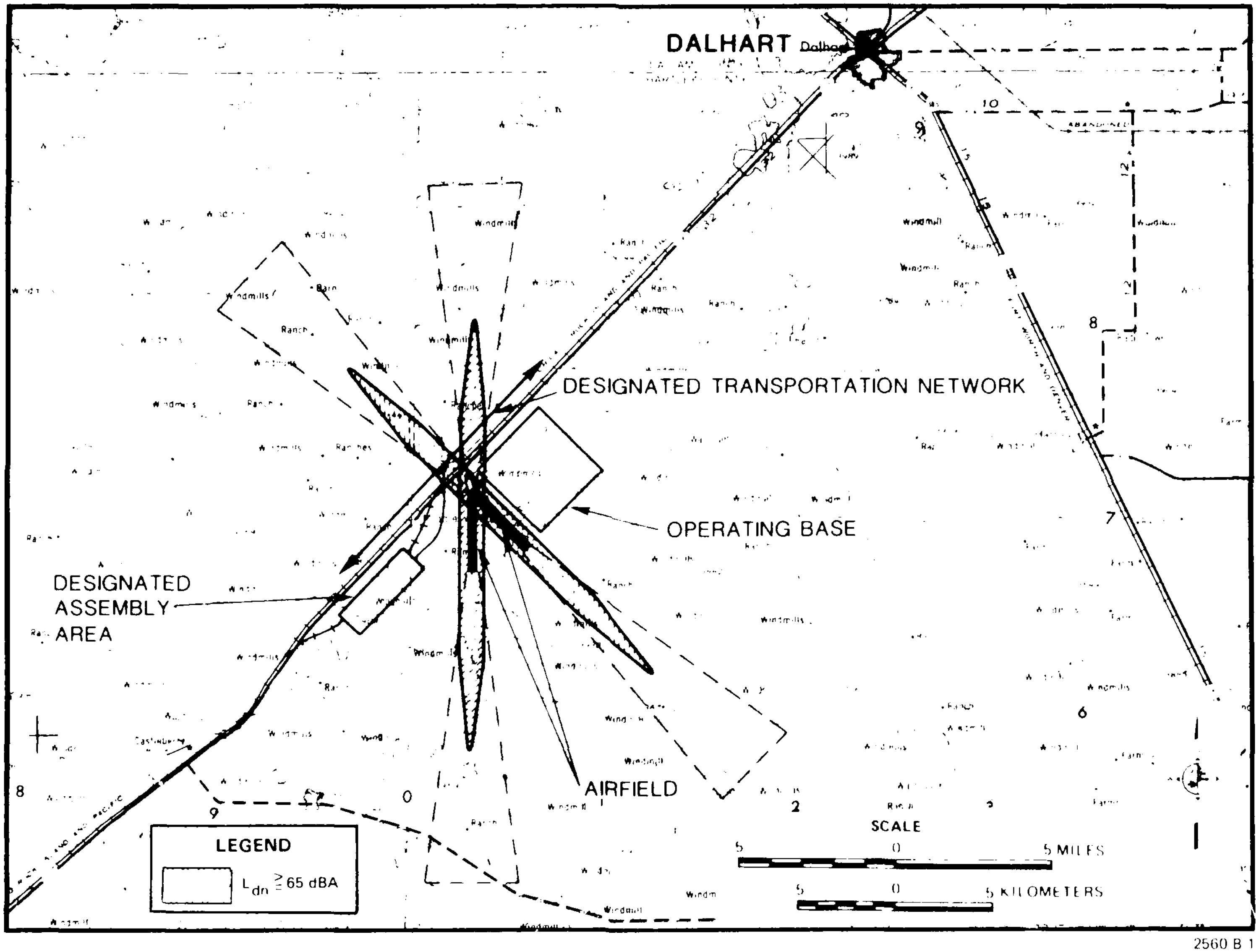
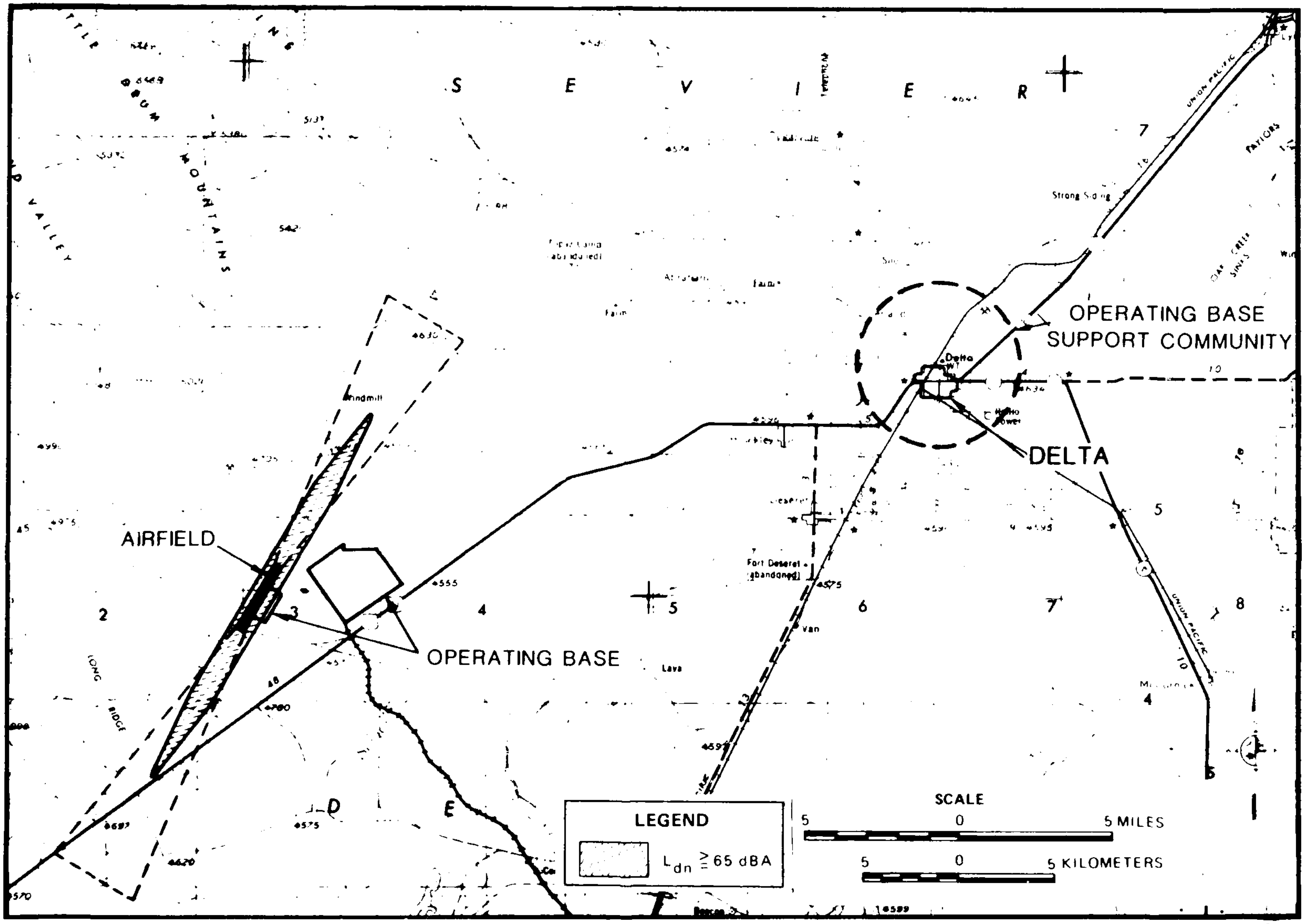


Figure 3.4-4. Airport noise contour, Dalhart, Texas.



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2559 B 1

Figure 3.4-5. Airport noise contour, Delta, Utah.

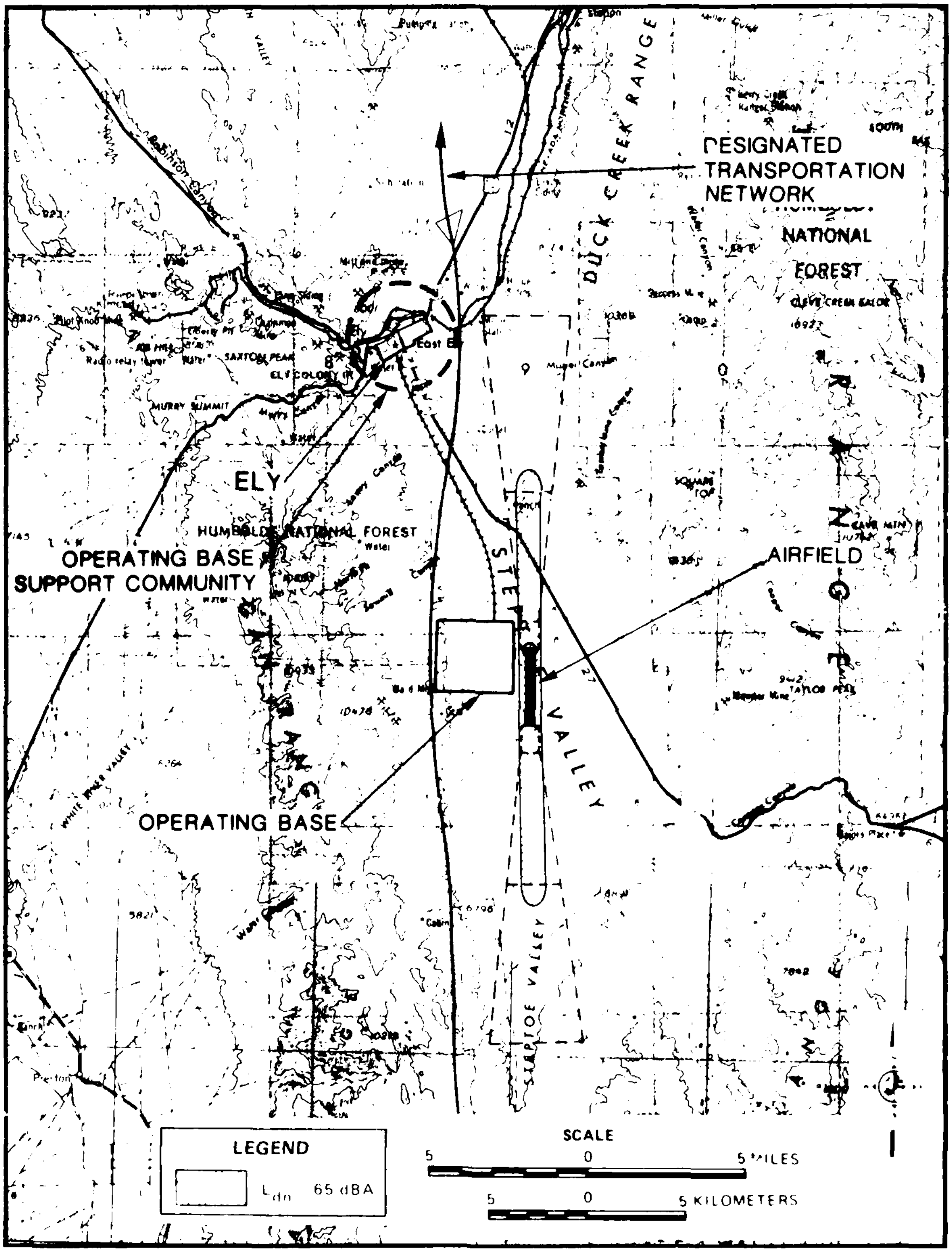

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Figure 3.4-6. Airport Noise contour, Ely, Nevada.

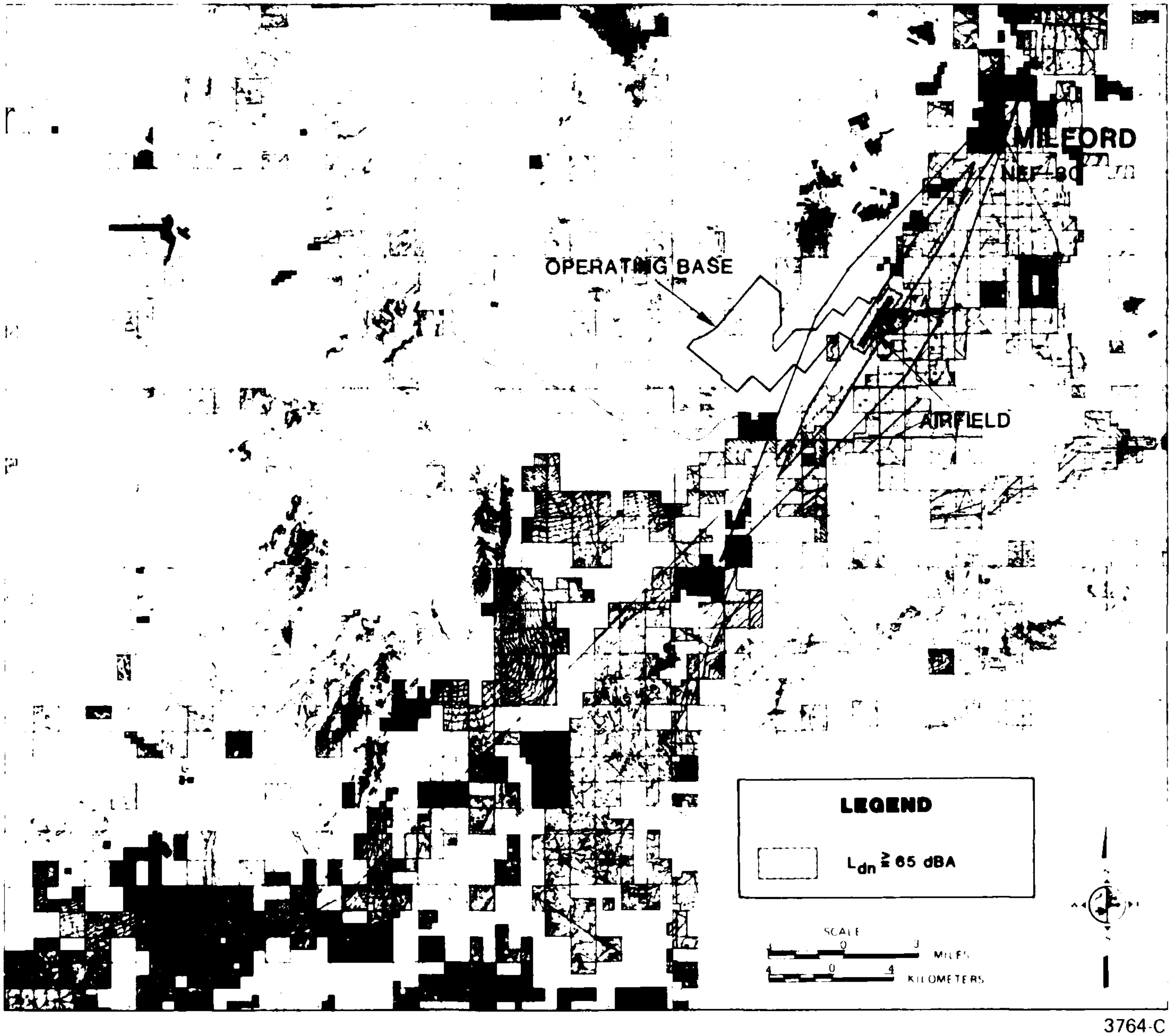

Figure 3.4-7. Airport noise contour, Milford, Utah.

possibly affected by the noise level zone. Cannon Air Force Base has been proposed for the operating base airfield. Sound levels expected from the additional aircraft operations wqould be minimal. As discussed earlier, superimposed sound increases the overall sound level by, at most, only 3 dB over the louder contributing sound level. (The noise contour in the figure does not include existing aircraft operation.)

COYOTE SPRING VALLEY, NEVADA - PROPOSED ACTION AND ALTERNATIVES 1, 2, 4, 6, AND 8. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Coyote Spring, Nevada is shown on Figure 3.4-3. There appear to be no affected land users.

DALHART, TEXAS - ALTERNATIVE 7. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Dalhart, Texas is shown on Figure 3.4-4. Two or three ranches appear to be affected.

DELTA, UTAH - ALTERNATIVE 2. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Delta, Utah is shown on Figure 3.4-5. There appear to be no affected land users.

ELY, NEVADA - ALTERNATIVE 5. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Ely, Nevada is shown on Figure 3.4-6. There appear to be no affected land users.

MILFORD, UTAH - PROPOSED ACTION, ALTERNATIVES 5 AND 6. The aircraft noise contour plot for the area surrounding the proposed operating base airfield at Milford, Utah is shown in Figure 3.4-7.

3.5 AIRFIELD DESIGN MITIGATIONS

The airfields will be located in accordance with Air Installation Compatible Use Zone (AICUZ) policy. This includes policies to locate airfields in such a manner as to avoid noise impacts on existing communities or residences.

4.0 SUMMARY AND CONCLUSIONS

4.1 TRAFFIC STUDY

At the level of detail of this study, noise generation and impact do not appear to be of major importance in the selection of alternatives. This is due to sparse populations and low volumes of traffic on the highways. Subsequent tiering studies may be necessary to document existing conditions and the number of land users potentially affected. In areas where impacts to residential communities are significant, noise mitigation techniques could be employed. Impacts on humans in the deployment area will be minimal both during and after construction. Impacts on animals cannot be determined at this time.

Railroad noise impacts would be small because of the limited increase of railroad activity during the peak construction period.

4.2 AIRPORT STUDY

The alternative operating base airfields locations are all proposed for remote, sparsely populated areas, with the exception of Clovis, New Mexico (Cannon Air Force Base), which is an existing Air Force training base. The analysis shows that noise impacts on present land users have been minimized.

It is concluded that any of the alternative operating base sites would be satisfactory with regard to noise impact. The only effect would be to prevent noise sensitive land use in the in the vicinity of the airfields.

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APPENDIX A

SUBJECTIVE NOISE CRITERIA

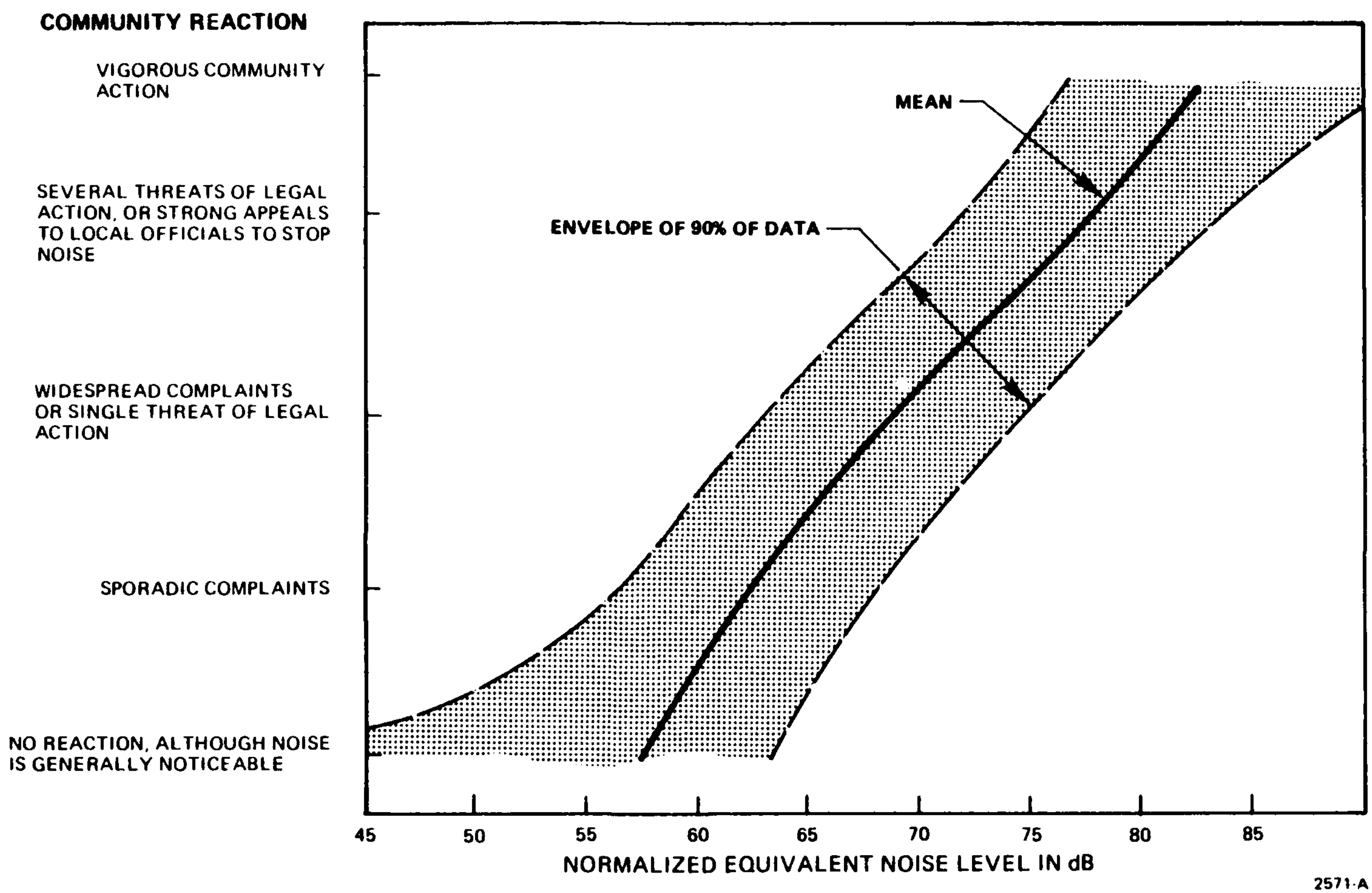

Figure A-1. Community reaction to intrusive noise (source: EPA, NTID 300.3, pg. 63, 1971)

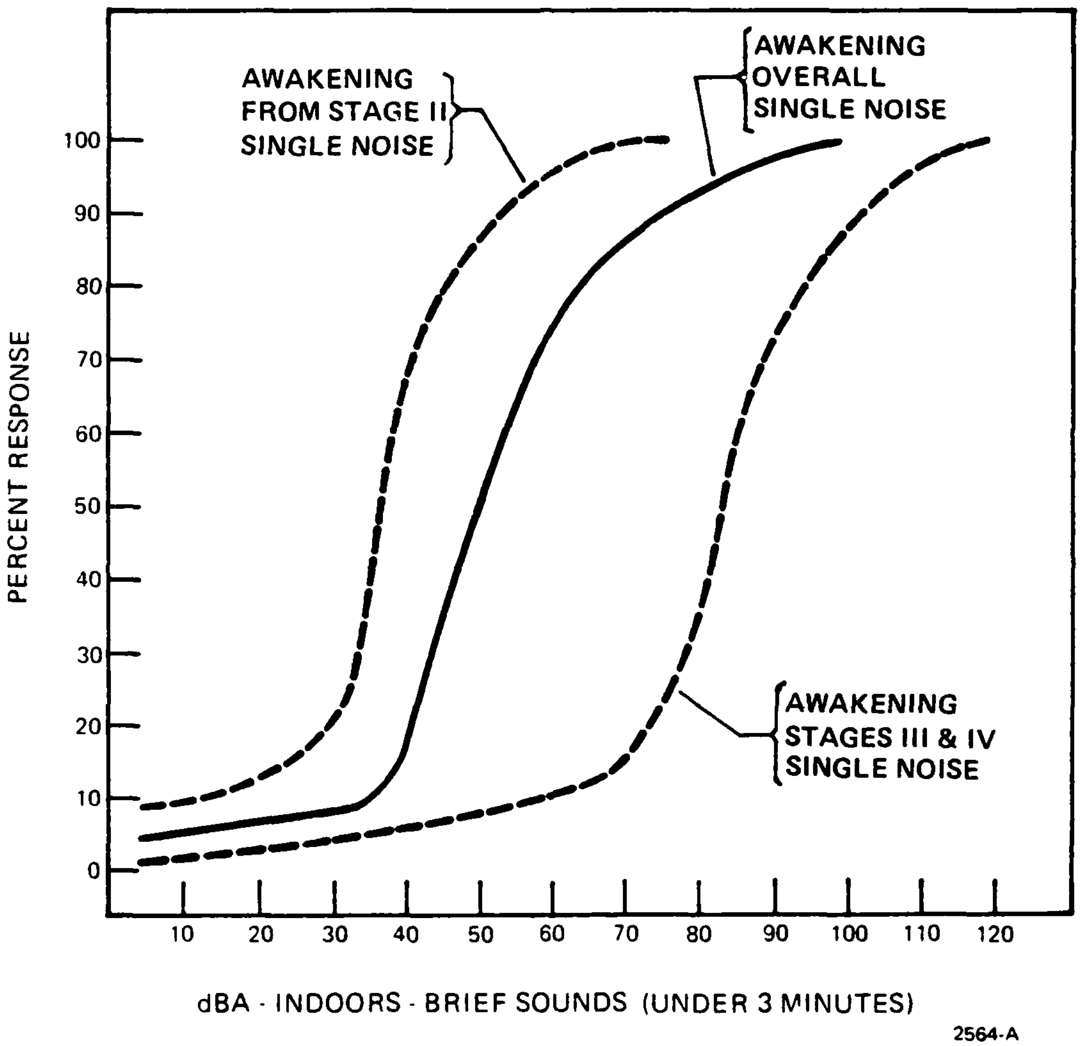

Figure A-2. Sleep interference as a function of intruding noise level for normally rested young adults, unacclimated.

Source: EPA, NTID 300.3, 1971

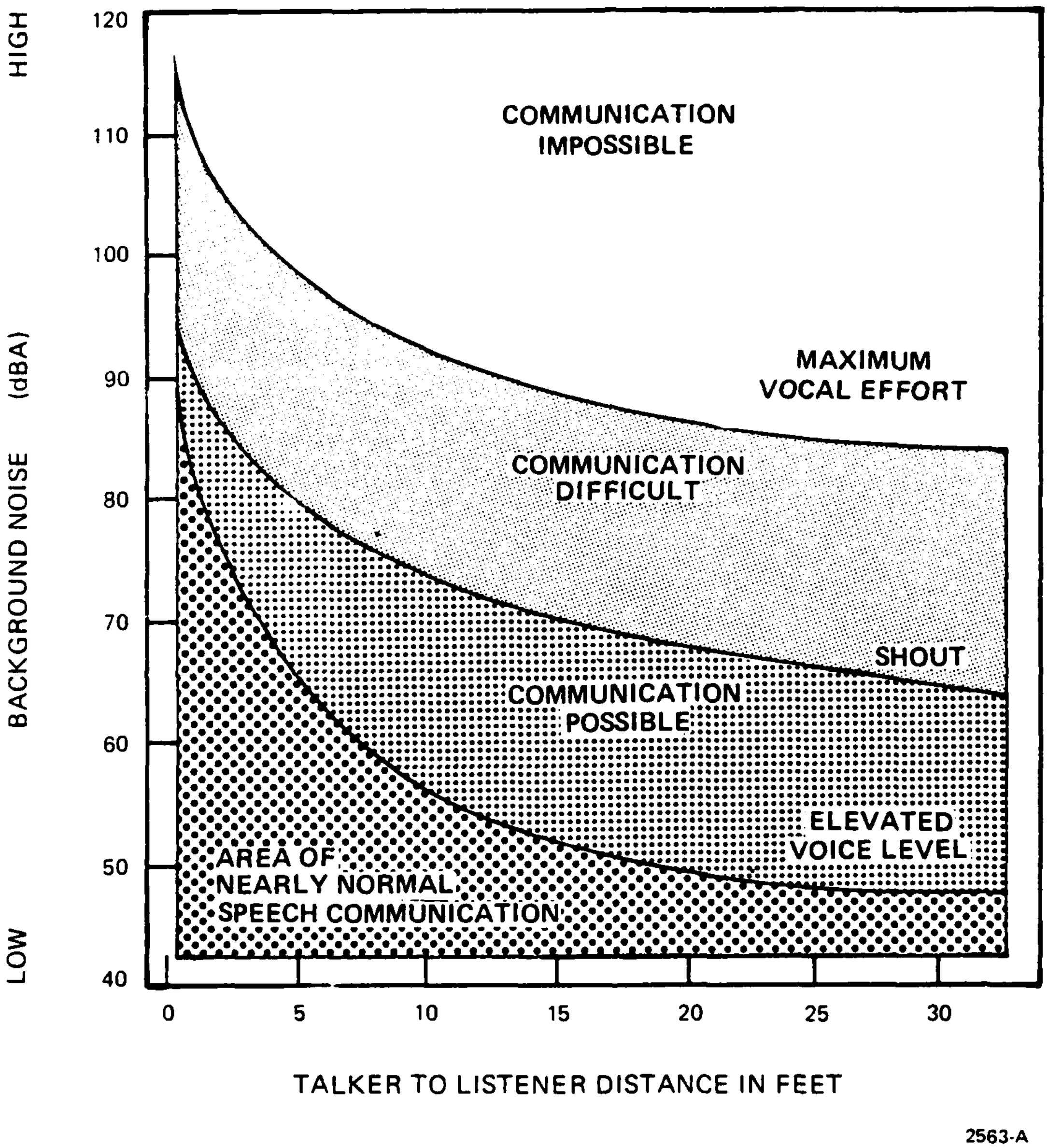

Figure A-3. Quality of speech communication in relation to distance between talker and listener (source: Oxnard Noise Element of General Plan).

APPENDIX B

DEFINITIONS

1. Decibel (dB) - A unit division on a logarithmic scale whose base is the 10th root of 10, used to represent ratios of quantities proportional to power.

2. Sound Pressure Level (SPL - dB) - Operationally,

   $$SPL = 20 \times \log (P/P_{ref})$$

   where P is the root mean square sound pressure.

3. A-weighted sound level (SLA - dBA) - Sound pressure level measured using the A-weighting network, a filter which discriminates against low and very high frequencies similar to the human hearing mechanism at moderate levels (ANSI S1.4, 1961).

4. Equivalent Sound Level (L_{eq}) - The sound level averaged on a power basis over a specified time period.

5. Percentile exceeded sound levels (L_x) - The sound level which is exceeded x percent of a specified time period.

6. Day Night Average Sound Level (L_{dn}) - The long-term sound level, averaged on a power basis, and weighted as follows:

   a. Frequency response is filtered using the A-weighting network.
   b. Sounds occurring between 2200 and 0700 hours are weighted by + 10 dB.

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APPENDIX C

LAND USE COMPATIBILITY GUIDELINES

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Table C-1. Land use compatibility guidelines. (Page 1 of 8)

LAND USE CATEGORY	COMPATIBLE USE DISTRICTS				
	L_{dn} 85	L_{dn} 80-85	L_{dn} 75-80	L_{dn} 70-75	L_{dn} 65-70
RESIDENTIAL					
Single Family	N	N	N	30^2	30^2
Two Family	N	N	N	30^2	25^2
Multifamily Dwelling	N	N	N	30^2	25^2
Group Quarters	N	N	N	30^2	25^2
Residential Hotels	N	N	N	30^2	25^2
Mobil Home Parks or Courts	N	N	N	30^2	25^2
Transient Lodging-Hotels, Motels	N	N	35^2	30^2	25^2
Other Residential	N	N	N	30^2	25^2
INDUSTRIAL/MANUFACTURING[3]					
Food and Kindred Product	N	Y^4	Y^5	Y^6	Y
Textile Mill Products	N	Y^4	Y^5	Y^6	Y
Apparel	N	Y^4	Y^5	Y^6	Y
Lumber and Wood Products	N	Y^4	Y^5	Y^6	Y
Furniture and Fixtures	N	Y^4	Y^5	Y^6	Y
Paper and Allied Products	N	Y^4	Y^5	Y^6	Y
Printing, Publishing	N	Y^4	Y^5	Y^6	Y
Chemicals and Allied Products	N	Y^4	Y^5	Y^6	Y
Petroleum Refining and Related Industries	N	Y^4	Y^5	Y^6	Y

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Note: Table explanations described on Table C-1, pages 7 of 8 and 8 of 8.

Table C-1. Land use compatibility guidelines. (Page 2 of 8)

LAND USE CATEGORY	COMPATIBLE USE DISTRICTS				
	L_{dn} 85	L_{dn} 80-85	L_{dn} 75-80	L_{dn} 70-75	L_{dn} 65-70
<u>INDUSTRIAL/MANUFACTURING</u>[3]					
Rubber and Miscellaneous Plastic	N	Y[4]	Y[5]	Y[6]	Y
Stone, Clay and Glass Products	N	Y[4]	Y[5]	Y[6]	Y
Primary Metal Industries	N	Y[4]	Y[5]	Y[6]	Y
Fabricated Metal Industries	N	Y[4]	Y[5]	Y[6]	Y
Professional, Scientific and Controlling Instruments	N	N	30	25	Y
Miscellaneous Manufacturing	N	Y	Y[5]	25	Y
<u>TRANSPORTATION, COMMUNICATIONS[7] AND UTILITIES</u>					
Railroad, Rapid Rail Transit	Y	Y	Y	Y	Y
Highway and Street ROW	Y	Y	Y	Y	Y
Auto Parking	N	Y	Y	Y	Y
Communication (noise sensitive)	N	N	30	25	Y
Utilities	Y	Y	Y	Y	Y
Other Trans, Comm, and Utilities	Y	Y	Y	Y	Y

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Table C-1. Land use compatibility guidelines. (Page 3 of 8)

LAND USE CATEGORY	COMPATIBLE USE DISTRICTS				
	L_{dn} 85	L_{dn} 80-85	L_{dn} 75-80	L_{dn} 70-75	L_{dn} 65-70
COMMERCIAL/RETAIL TRADE					
Wholesale Trade	N	Y^4	Y^5	Y^6	Y
Building Materials-Retail	N	Y^4	Y^5	Y^6	Y
General Merchandise-Retail	N	N	30	25	Y
Food-Retail	N	N	30	25	Y
Automotive, Marine	N	N	30	25	Y
Apparel and Accessories Retail	N	N	30	25	Y
Eating and Drinking Places	N	N	30	25	Y
Furniture, Home Furnishing Retail	N	N	30	25	Y
Other Retail Trade	N	N	30	25	Y
PERSONAL AND BUSINESS[8] SERVICES					
Finance, Insurance & Real Estate	N	N	30	25	Y
Personal Services	N	N	30	25	Y
Business Services	N	N	30	25	Y
Repair Services	N	Y^4	Y^5	Y^6	Y
Contract Construction Services	N	N	30	25	Y

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Table C-1. Land use compatibility guidelines. (Page 4 of 8)

LAND USE CATEGORY	COMPATIBLE USE DISTRICTS				
	L_{dn} 85	L_{dn} 80-85	L_{dn} 75-80	L_{dn} 70-75	L_{dn} 65-70
PERSONAL AND BUSINESS SERVICES[8]					
Indoor Recreation Services	N	N	30	25	Y
Other Services	N	N	30	25	Y
PUBLIC AND QUASIPUBLIC SERVICES					
Government Services	N	N	30	25	Y
Educational Services	N	N	N	30	25
Cultural Activities (including churches)	N	N	N	30	25
Medical and Other Health Services[9]	N	N	N	30	25
Cemeteries	Y	Y[4]	Y[5]	Y[6]	Y
Nonprofit Organization	N	N	N	30	25
Other Public and Quasipublic Services	N	N	N	30	25
OUTDOOR RECREATION					
Playgrounds, Neighborhood Parks	N	N	N	Y	Y
Community and Regional	N	N	N	Y[11]	Y

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Table C-1. Land use compatibility guidelines. (Page 5 of 8)

LAND USE CATEGORY	COMPATIBLE USE DISTRICTS				
	L_{dn} 85	L_{dn} 80-85	L_{dn} 75-80	L_{dn} 70-75	L_{dn} 65-70
OUTDOOR RECREATION (cont)					
Nature Exhibits	N	N	N	N	Y
Spectator Sports Including Arenas	N	N	N	N	Y
Golf Course[12], Riding Stables[13]	N	N	Y[14]	Y[15]	Y
Water Based Recreational Areas	N	N	Y[14]	Y[15]	Y
Resort and Group Camps	N	N	N	Y	Y
Auditoriums, Concert Halls	N	N	N	N	Y
Outdoor Amphitheaters, Music Halls	N	N	N	N	N
Other Outdoor Recreation	N	N	N	Y	Y
RESOURCE PRODUCTION, EXTRACTION, AND OPEN SPACE					
Agriculture (except livestock)	Y[17]	Y[17]	Y[17]	Y[18]	Y[19]
Livestock Farming, Animal Breeding	N	N	Y[17]	Y[18]	Y[19]
Forestry Activities	Y[17]	Y[17]	Y[17]	Y[18]	Y[19]

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Table C-1. Land use compatibility guidelines. (page 6 of 8)

LAND USE CATEGORY	COMPATIBLE USE DISTRICTS				
	L_{dn} 85	L_{dn} 80-85	L_{dn} 75-80	L_{dn} 70-75	L_{dn} 65-70
<u>RESOURCE PRODUCTION EXTRACTION, AND OPEN SPACE</u> (cont)					
Fishing Activities and Related Services	Y	Y	Y	Y	Y
Mining Activities	Y	Y	Y	Y	Y
Permanent Open Space	Y	Y	Y	Y	Y
Water Areas	Y	Y	Y	Y	Y

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Table C-1. Land use compatibility guidelines. (Page 7 of 8)

N (NO)	- The land use and related structures are not compatible and should be prohibited.
Y (YES)	- The land use and related structures are compatible without restriction and should be considered.
Y^x (YES WITH RESTRICTIONS)	- The land use and related structures are generally compatible; however, some special factors should be considered.
35,30 or 25	- The land use is generally compatible; however, a Noise Level Reduction of 35, 30 or 25 must be incorporated into the design and construction of the structure.
35^x, 30^x or 25^x	- The land use is generally compatible with NLR: however, such NLR does not necessarily solve noise difficulties and additional evaluation is warranted.
1	- Because of accident hazard potential, the residential density in these CUD's should be limited to the maximum extent possible. It is recommended that residential density not exceed one dwelling unit per acre. Such use should be permitted only following a demonstration of need to utilize this area for residential purposes.
2	- Although it is recognized thatlocal conditions may require residential uses in these CUD's, this use is strongly discouraged in CUD's 10 and 12 and discouraged in CUD's 11 and 13. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these CUD's should be conducted prior to approvals. Where the community determines that residential uses must be allowed Noise Level Reductions (NLR) of at least 30 (CUD's 10 and 12) and 25 (CUD's 11 and 13) should be incorporated into building codes and/or individual approvals. Additional consideration should be given to modify the NLR levels based on peak noise levels. Such criteria will not eliminate outdoor environment noise problems and, as a result, site planning and design should include measures to minimize this impact particularly where the noise is from ground level sources.

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Table C-1. Land use compatibility guidelines. (Page 8 of 8)

3	-	Because these uses vary considerably by locality and within a general category, particular care should be taken to evaluate and modify guidelines to fit local conditions. Among factors to be considered: labor intensity, structural coverage explosive inflammable characteristics, size of establishment, people density, peak period (including shopper/visitors) concentrations.
4	-	A NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.
5	-	A NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.
6	-	A NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.
7	-	No structures in Clear Zone, no passenger terminals, and no major ground transmission lines in Clear Zones or APZ I.
8	-	Low intensity office uses only (limited scale of concentration of such uses), meeting places, auditoriums, etc. not recommended.
9	-	Excludes hospitals.
10	-	Excludes chapels.
11	-	Facilities must be low intensity.
12	-	Clubhouse not recommended.
13	-	Concentrated rings with large classes not recommended.
14	-	A NLR of 30 must be incorporated into buildings for this use.
15	-	A NLR of 25 must be incorporated into buildings for this use.
16	-	No structures in Clear Zone.
17	-	Residential structures not permitted.
18	-	Residential buildings require a NLR of 30.
19	-	Residential buildings require a NLR of 25.

Source: HDR Sciences, 1981

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APPENDIX D

NOISE EMISSION STANDARDS FOR TRANSPORTATION EQUIPMENT; INTERSTATE RAIL CARRIERS (ref. 40 CFR 201)

Equipment	Maximum Noise Level (dBA)	
Rail Cars[1]		
At speeds of 45 mph or less	88	
At speeds of more than 45 mph	93	
Locomotives[1]	Old Equipment	New Equipment (mfg. after 1979)
Stationary		
At idle setting	73	70
At other throttle settings	93	87
Moving	96	90
Switch Yard Retarders[2]	83	
Car Coupling Operations[2]	92	

1. Noise measurements at 30 meters.
2. Noise measurements at "receiving property" line, i.e. property adjacent to railroad owned facility.

APPENDIX E

EFFECTS OF NOISE ON WILDLIFE AND LIVESTOCK
(From Appendix E, EPA "Levels" Document 1974)

Noise produces the same general types of effects on animals as it does on humans, namely: hearing loss, masking of communications, and behavioral and nonauditory physiological effects.

The most observable effects of noise on farm and wild animals seem to be behavioral. Clearly, noise of aversive character can disrupt normal patterns of animal existence. Exploratory behavior can be curtailed, avoidance behavior can limit access to food and shelter, and breeding habits can be disrupted. Hearing loss and the masking of auditory signals can further complicate an animal's efforts to recognize its young, detect and locate prey, and evade predators. Competition for food and space in an "ecological niche" results in complex interrelationships and, hence, a complex balance.

Laboratory studies have indicated temporary and permanent noise-induced threshold shifts. However, damage-risk criteria for various species have not yet been developed. Masking of auditory signals has been demonstrated by commercial jamming signals, which are amplitude and frequency modulated.

Physiological effects of noise exposure, such as changes in blood pressure and chemistry, hormonal balance and reproductivity have been demonstrated in laboratory animals and, to some extent, in farm animals. But these effects are understandably difficult to assess in wildlife. Also, the amount of physiological and behavioral adaptation that occurs in response to noise stimuli is as yet unknown.

Considerable research is needed before more definitive criteria can be developed. The basic needs are:

- More thorough investigations to determine the point at which various species incur hearing loss

- Studies to determine the effects on animals of low-level, chronic noise exposures

- Comprehensive studies on the effects of noise on animals in their natural habitats. Such variables as the extent of aversive reactions, physiological changes, and predator-prey relationships should be examined.

Until more information exists, judgments of environmental impact must be based on the existing information, however incomplete. The simplest approach is to assure that animals will be at least partially protected by application of maximum levels identified for human exposure.

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